

E&A

BULLETIN 292

DECEMBER, 1927

IMP. BUR.

21 APR. 1928

ENTOM.

Connecticut Agricultural Experiment Station

New Haven, Connecticut

Some Insect Pests of Nursery Stock  
in Connecticut

W. E. BRITTON and M. P. ZAPPE



**Connecticut Agricultural Experiment Station**  
New Haven, Connecticut

---

**Some Insect Pests of Nursery Stock  
in Connecticut**

*Catfish*

W. E. BRITTON and M. P. ZAPPE

The Bulletins of this Station are mailed free to citizens of Connecticut who apply for them, and to other applicants as far as the editions permit.

# CONNECTICUT AGRICULTURAL EXPERIMENT STATION

## OFFICERS AND STAFF

### BOARD OF CONTROL

|                                                                 |              |
|-----------------------------------------------------------------|--------------|
| His Excellency, John H. Trumbull, <i>ex-officio</i> , President |              |
| Charles R. Treat, <i>Vice-President</i> .....                   | Orange       |
| George A. Hopson, <i>Secretary</i> .....                        | Mount Carmel |
| Wm. L. Slate, <i>Director and Treasurer</i> .....               | New Haven    |
| Joseph W. Alsop.....                                            | Avon         |
| Elijah Rogers.....                                              | Southington  |
| Edward C. Schneider.....                                        | Middletown   |
| Francis F. Lincoln.....                                         | Cheshire     |

### STAFF.

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         | E. H. JENKINS, PH.D., <i>Director Emeritus</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Administration.                         | WM. L. SLATE, B.Sc., <i>Director and Treasurer</i> .<br>MISS L. M. BRAUTLECHT, <i>Bookkeeper and Librarian</i> .<br>MISS J. V. BERGER, <i>Assistant Bookkeeper</i> .<br>MRS. R. A. HUNTER, <i>Secretary</i> .<br>G. E. GRAHAM, <i>In charge of Buildings and Grounds</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Chemistry.<br>Analytical<br>Laboratory. | E. M. BAILEY, PH.D., <i>Chemist in Charge</i> .<br>C. E. SHEPARD<br>OWEN L. NOLAN<br>HARRY J. FISHER, A.B. } <i>Assistant Chemists</i> .<br>DAVID C. WALDEN, B.S.<br>W. T. MATHIS<br>FRANK C. SHELDON, <i>Laboratory Assistant</i> .<br>V. L. CHURCHILL, <i>Sampling Agent</i> .<br>MISS MABEL BACON, <i>Secretary</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Biochemical<br>Laboratory.              | T. B. OSBORNE, PH.D., <i>Chemist in Charge</i> .<br>H. B. VICKERY, PH.D., <i>Biochemist</i> .<br>MISS HELEN C. CANNON, B.S., <i>Dietitian</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Botany.                                 | G. P. CLINTON, ScD., <i>Botanist in Charge</i> .<br>E. M. STODDARD, B.S., <i>Pomologist</i> .<br>MISS FLORENCE A. MCCORMICK, PH.D., <i>Pathologist</i> .<br>GEORGE L. ZUNDEL, M.S.A., <i>Graduate Assistant</i> .<br>A. D. McDONNELL, <i>General Assistant</i> .<br>MRS. W. M. KELSEY, <i>Secretary</i> .<br>W. E. BRITTON, PH.D., <i>Entomologist in Charge; State Entomologist</i> .<br>B. H. WALDEN, B.Agr. }<br>M. P. ZAPPE, B.S. } <i>Assistant Entomologists</i> .<br>PHILIP GARMAN, PH.D. }<br>ROGER B. FRIEND, PH.D. }<br>J. P. JOHNSON, B.S., <i>Deputy in Charge of Japanese Beetle Quarantine</i> .<br>JOHN T. ASHWORTH, <i>Deputy in Charge of Gipsy Moth Work</i> .<br>R. C. BOTSFORD, <i>Deputy in Charge of Mosquito Elimination</i> .<br>MISS GRACE A. FOOTE, B.A., <i>Secretary</i> . |
| Forestry.                               | WALTER O. FILLEY, <i>Forester in Charge</i> .<br>H. W. HICOCK, M.F., <i>Assistant Forester</i> .<br>J. E. RILEY, JR., M.F., <i>In Charge of Blister Rust Control</i> .<br>H. J. LUTZ, M.F., <i>Assistant Forester</i> .<br>MISS PAULINE A. MERCHANT, <i>Secretary</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Plant Breeding.                         | DONALD F. JONES, S.D., <i>Geneticist in Charge</i> .<br>W. R. SINGLETON, S.M., <i>Assistant Geneticist</i> .<br>H. R. MURRAY, B.S., <i>Graduate Assistant</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Soil Research.                          | M. F. MORGAN, M.S., <i>Agronomist</i> .<br>H. G. M. JACOBSON, M.S., <i>Assistant</i> .<br>MISS EVELYN M. GRAY, <i>Secretary</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Tobacco Sub-station<br>at Windsor.      | PAUL J. ANDERSON, PH.D., <i>Pathologist in Charge</i> .<br>N. T. NELSON, PH.D., <i>Assistant Physiologist</i> .<br>T. R. SWANBACK, B.S., <i>Scientific Assistant</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



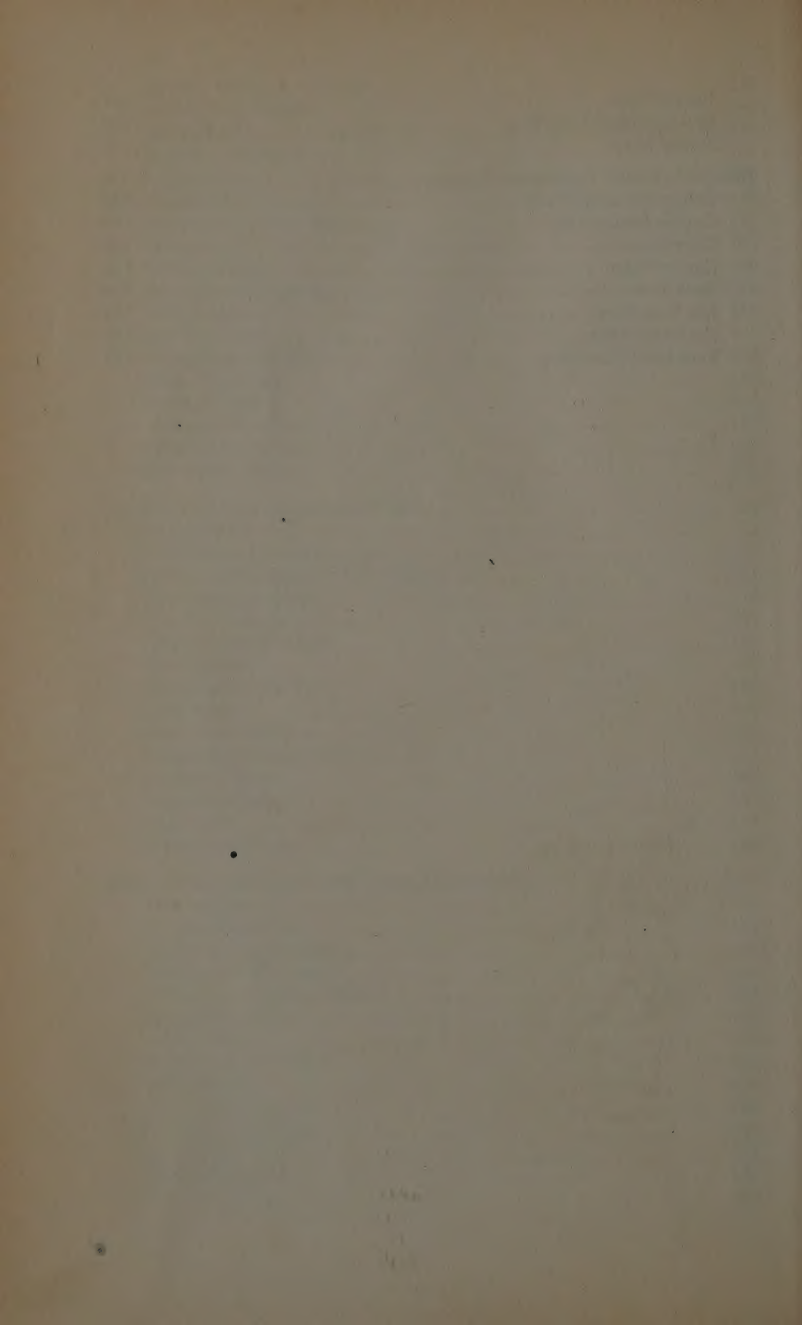
# CONTENTS

---

|                                                        | PAGE |
|--------------------------------------------------------|------|
| GENERAL FEEDERS.....                                   | 119  |
| Leopard Moth.....                                      | 120  |
| Fall Webworm.....                                      | 120  |
| Cankerworms.....                                       | 120  |
| Tussock Moths.....                                     | 121  |
| Gipsy Moth.....                                        | 122  |
| European Fruit Lecanium.....                           | 123  |
| Oyster-shell Scale.....                                | 123  |
| INSECTS INJURING FRUIT STOCK.....                      | 124  |
| Eastern Tent Caterpillar.....                          | 125  |
| Apple and Thorn Skeletonizer.....                      | 126  |
| Red-humped Caterpillar.....                            | 126  |
| Yellow-necked Caterpillar.....                         | 127  |
| Japanese Beetle.....                                   | 127  |
| Rose Chafer.....                                       | 128  |
| Pear Slug.....                                         | 129  |
| Imported Currant Worm.....                             | 129  |
| Climbing Cutworms.....                                 | 130  |
| New York Weevil.....                                   | 131  |
| Apple Tree Borers.....                                 | 131  |
| Oriental Peach Moth.....                               | 132  |
| Peach Borer.....                                       | 132  |
| Shot-hole Borer.....                                   | 133  |
| Imported Currant Borer.....                            | 134  |
| Green Apple Aphid.....                                 | 134  |
| Woolly Apple Aphid.....                                | 135  |
| Black Cherry Aphid.....                                | 136  |
| Currant Aphids.....                                    | 136  |
| San José Scale.....                                    | 137  |
| Scurfy Scale.....                                      | 137  |
| Leaf Hoppers on Apple.....                             | 138  |
| Tarnished Plant Bug.....                               | 139  |
| Pear Leaf Blister Mite.....                            | 140  |
| European Red Mite.....                                 | 140  |
| INSECTS INJURING DECIDUOUS SHADE AND FOREST TREES..... | 141  |
| Larch Case Bearer.....                                 | 142  |
| Locust Leaf Miner.....                                 | 143  |
| Imported Birch Leaf Miner.....                         | 143  |
| Birch Skeletonizer.....                                | 144  |
| Elm Leaf Beetle.....                                   | 144  |
| Willow Flea Beetle.....                                | 145  |
| Imported Willow Leaf Beetle.....                       | 145  |
| Cottonwood Leaf Beetle.....                            | 145  |

|                                                        |            |
|--------------------------------------------------------|------------|
| Spotted Willow Leaf Beetle.....                        | 145        |
| Poplar Tent Maker.....                                 | 146        |
| Larch Sawfly.....                                      | 146        |
| Bronze Birch Borer.....                                | 147        |
| Linden Borer.....                                      | 148        |
| Locust Borer.....                                      | 148        |
| Poplar and Willow Borer.....                           | 149        |
| Mites.....                                             | 150        |
| Green Aphids.....                                      | 150        |
| Beech Woolly Aphid.....                                | 151        |
| Willow Aphids.....                                     | 151        |
| Oak Gall Scale.....                                    | 151        |
| Pit-making Oak Scale.....                              | 151        |
| Tulip Tree Scale.....                                  | 152        |
| Terrapin Scale.....                                    | 152        |
| European Elm Scale.....                                | 153        |
| Cottony Maple Scale.....                               | 153        |
| Elm Scurfy Scale.....                                  | 154        |
| <b>INSECTS INJURING SHRUBS AND VINES.....</b>          | <b>154</b> |
| Io Caterpillar.....                                    | 155        |
| Saddle-back Caterpillar.....                           | 155        |
| Sphinx Caterpillars or Horn Worms.....                 | 156        |
| Pipe-vine Caterpillar.....                             | 156        |
| Cecropia Caterpillar.....                              | 156        |
| Eight-spotted Forester.....                            | 157        |
| Rose Sawflies.....                                     | 157        |
| Honeysuckle Sawflies.....                              | 158        |
| Lilac Borer.....                                       | 158        |
| Rose Stem Girdler.....                                 | 158        |
| Grape-vine Tomato Gall.....                            | 158        |
| Eriophyid Mites.....                                   | 159        |
| Euonymus Scale.....                                    | 159        |
| Rose Scale.....                                        | 159        |
| White Peach Scale.....                                 | 159        |
| <b>INSECT PESTS OF EVERGREEN TREES AND SHRUBS.....</b> | <b>160</b> |
| Pine Sawflies.....                                     | 161        |
| Juniper Webworm.....                                   | 161        |
| Arborvitae Leaf-Miner.....                             | 161        |
| Boxwood Leaf-Miner.....                                | 162        |
| European Pine Shoot Moth.....                          | 162        |
| Spruce Budworm.....                                    | 162        |
| Pales Weevil.....                                      | 163        |
| Otiorhynchid Weevils.....                              | 163        |
| White Grubs.....                                       | 164        |
| White Pine Weevil.....                                 | 164        |
| Rhododendron Borer.....                                | 165        |
| Spruce Gall Aphids.....                                | 165        |
| Pine Bark Aphid.....                                   | 166        |
| Pine Leaf Scale.....                                   | 166        |

|                                               |            |
|-----------------------------------------------|------------|
| Juniper Scale.....                            | 167        |
| Rhododendron Lace Bug.....                    | 167        |
| Spruce Mite.....                              | 167        |
| <b>INSECTS INJURING PERENNIAL PLANTS.....</b> | <b>168</b> |
| Columbine Leaf-Miner.....                     | 168        |
| Garden Spring-Tail.....                       | 169        |
| Cutworms.....                                 | 169        |
| Garden Slugs.....                             | 170        |
| Stalk Borer.....                              | 170        |
| Iris Root Borer.....                          | 171        |
| Cyclamen Mite.....                            | 172        |
| Four-lined Plant-Bug.....                     | 172        |





# Some Insect Pests of Nursery Stock in Connecticut

W. E. BRITTON and M. P. ZAPPE

W.

Just about thirty years ago, the first nursery inspections were made in Connecticut at the request of nurserymen, so that they could advertise their stock as having been officially inspected. In 1901, the General Assembly passed a law establishing the office of State Entomologist and providing for the annual inspection of nurseries. Thus for twenty-seven years all nurseries have been inspected each year as required by law, and records are available showing the various insects found on the many species and varieties of fruit, shade, forest, and ornamental stock. The more important insect pests are treated in this bulletin for the guidance of nurserymen and plant growers throughout the State.

For convenience in identifying nursery insects, brief keys are arranged under each of the following classes: General Feeders; Insects Injuring Fruit Stock; Shade and Forest Trees; Shrubs and Vines; Evergreens; Perennials.

Following the account of each insect in most cases, one or two references are given where more complete information may be found, mostly reports and bulletins of this Station and of the United States Department of Agriculture.

## GENERAL FEEDERS

### KEY

1. Chewing caterpillars devouring the tissues ..... 2  
Scale insects on bark, sucking the sap ..... 6
2. Feeding upon the leaves ..... 3  
Boring in the wood ..... Leopard Moth, p. 120
3. Making no conspicuous nest or web ..... 4  
Hairy caterpillars feeding in web at end of branches,  
Fall Webworm, p. 120
4. Caterpillars covered with prominent hairs ..... 5  
Caterpillars smooth, making loop when crawling, Cankerworms, p. 120
5. With black, white, or yellow tufts of hair..... Tussock Moths, p. 121  
Gray or brown, without black, white, or yellow tufts; first five pairs  
of tubercles blue, remaining six pairs red..... Gipsy Moth, p. 122
6. Convex hemispherical brown shells... European Fruit Lecanium, p. 123  
Elongated curved shells, nearly the same color as bark,  
Oyster-shell Scale, p. 123

LEOPARD MOTH (*Zeuzera pyrina* Linn.)

The larva of the leopard moth is a borer in the wood of nearly all kinds of deciduous trees and frequently is found in nursery stock—especially in apple trees. It requires two years for its complete development. The adults emerge and the female lays eggs on the bark in July. The young larva tunnels in small twigs, which often break off, and then the borer enters the trunk or larger branches. It pupates in the burrow, from which the adult emerges, leaving the pupa case protruding from the tree. The mature larva is about two inches long and is whitish, with tubercles, head, cervical and anal shields dark brown or black, and is shown on Plate I, d. The adults are a dirty white with semi-transparent wings marked with metallic blue dots and have a wing expanse of about one and three-fourths inches in the male to two and one-half inches in the female. In small nursery trees it is best to destroy the tree or branch infested. In larger trees it is possible to kill the borers with knife or wire, or inject a few drops of carbon disulphide and close the mouth of the tunnel.

(Bulletin 169).

FALL WEBWORM (*Hyphantria cunea* Drury)

All kinds of fruit, shade, and forest deciduous trees and shrubs are subject to the attack of the fall webworm. This insect makes webs or nests on the ends of branches late in summer, and the caterpillars feed inside them. The nests are most noticeable in August and September, though an occasional nest may be seen in June, and a larger number in July. Nests are shown on Plate II, a. There is one generation each year, with a partial second in Connecticut. The earliest nests may produce webworms which develop to the adult stage the same season, and the females lay eggs for the second generation. The adult is a white moth which lays eggs in a compact mass on the under side of a leaf. The young caterpillars make a nest enclosing the leaves on the end of a branch. After devouring the food, they extend the nest to include more leaves. The mature caterpillars are more than an inch long, striped lengthwise with brown and yellow, and covered with brownish hairs.

Trees may be protected by spraying with lead arsenate, and the nests may be destroyed by clipping off and burning them.

(Report for 1917, page 319).

## CANKERWORMS

Cankerworms are small looping caterpillars which feed upon the leaves during May. Some are green and others are dark brown or gray. Two species are involved. The more common one in Con-

necticut is known as the fall cankerworm, *Alsophila pometaria* Harris, because the moths emerge and the females lay their eggs in late fall. These eggs are gray, cylindrical, and laid on the bark in compact clusters of about one hundred eggs arranged side by side and all standing on end. (Shown in Fig. 11 and on Plate I, a, b, c). The other species is called the spring cankerworm, *Paleacrita vernata* Peck, and lays its eggs in loose clusters on the bark in March. These egg-clusters contain an average of about fifty eggs each and are not all arranged on end like those of the fall cankerworm.

The caterpillars of both species appear at the same time and cause the same type of injury to the leaves. They may be distin-

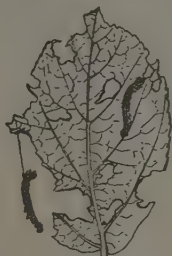


FIG. 11. Cankerworms.



FIG. 12. Larva of the white-marked tussock moth.

guished by the fact that the fall cankerworm has a pair of pro-legs on the eighth segment, which are absent in the spring cankerworm.

Each has a single generation annually. The caterpillars usually become full grown by the first week of June and enter the ground to pupate. The females of both species are without wings and are obliged to crawl up the trunks of trees in order to lay their eggs. The males have wings and are ash-gray in color.

Spraying the foliage with lead arsenate is the remedy.

(Bulletin 1238, U. S. Dept. of Agriculture).

### TUSSOCK MOTHS

There are several species of tussock moths, the larvae of which devour the leaves of deciduous trees and shrubs. Perhaps the most important is the white-marked tussock moth, *Hemerocampa leucostigma* S. & A., which has two generations each season. It hibernates in the egg stage as glistening white frothy egg-clusters on the bark of trees. The caterpillars present a very striking appearance, being striped lengthwise with brown and yellow; the head is bright red and there are four tufts of white or buff up-

standing hairs on the back; two forward-reaching pencils of long black hairs are borne near the head and a similar one reaches backward near the tail, as shown in Fig. 12 and on Plate II, c.

The caterpillars feed on the leaves of fruit trees, and shade and forest trees, especially elm, maple, linden, and horsechestnut. The female is wingless and lays its eggs on the old cocoon, as shown on Plate II, f.

The hickory tussock moth, *Halisidota caryae* Harris, has one generation annually, and the caterpillar, shown on Plate II, b, is covered with white hairs marked with black hairs to form a black median line, and two pencils of black hairs at each end of the body. It feeds upon hickory, apple, oak, elm, maple, poplar, linden, and many other trees. The tessellated tussock moth, *H. tessellaris* S. & A., also feeds upon a large number of shade and forest trees, though it is usually less abundant than the hickory or white-marked tussock moths. Its caterpillar resembles *caryae* but has light brown instead of white hairs.

The remedy for all three species is to spray the foliage with lead arsenate.

(Report for 1917, page 325).

#### GIPSY MOTH (*Porthetria dispar* Linn.)

Though not particularly a pest of nursery stock, in seriously infested areas it may be considered as such. There is but one generation each year, the eggs being laid in midsummer and hatching the following spring. The caterpillars feed from birth, about May 1, until fully grown, late in June. They are about two inches in length, hairy, and generally of a brownish or grayish color, sometimes with a distinct median stripe, each side of which there is a row of tubercles or spots. Beginning with the head, the first five pairs of tubercles are bright blue, and the remaining six pairs are a dull brick red.

The pupae are formed in cavities, crotches, on the under side of branches, fence rails, and in other protected situations. From ten to fourteen days are passed in this stage, when the adults emerge. The male is usually a light, grayish-brown moth with a wingspread of about one and one-half inches, though varying to dark brown. It is a strong flyer and flies during the day. The female has a heavy body and does not fly, is dirty white or buff in color, with wings marked with brownish zigzag cross-bands, as shown in Fig. 13. It has a wing expanse of two inches or more and is usually seen resting on the trunks or branches of trees where the eggs are laid. The eggs are laid in clusters of 200 to 400 each and are covered with hairs from the body of the female parent. These clusters are about an inch long and two-thirds as broad. They



look and feel like a bit of chamois skin. An egg cluster, cocoon, and caterpillar are shown on Plate II, d. and e.

Though the gipsy caterpillars feed upon many kinds of trees, shrubs, and plants, they seem to prefer apple, oak, and willow. Ash is nearly exempt from injury. The remedies are to spray the foliage with lead arsenate in May and June to kill the caterpillars, and to soak the egg-clusters, whenever found, with creosote to prevent hatching.

(Bulletin 186).



FIG. 13. Gipsy Moth.

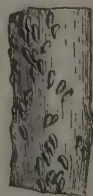


FIG. 14. Oyster-shell scale.

EUROPEAN FRUIT LECANIUM (*Lecanium corni* Bouché—*armeniaceum* Craw.)

This European scale has now become one of the most common of all the brown soft scales in the eastern United States. Not only does it attack and injure fruit trees, but also rose, blackberry, ash, chestnut, oak, maple, elm, and linden.

This is a reddish-brown scale, very convex in shape, and the individuals are usually thickly clustered on one side of the stem. Each reaches a diameter of about one-eighth of an inch. The species hibernates on the twigs in a partially grown condition. The young emerge in May and June. (Shown on Plate III, b).

This scale may be killed by dormant sprays of lime-sulphur and miscible oils.

(Report for 1905, page 237).

OYSTER-SHELL SCALE (*Lepidosaphes ulmi* Linn.)

The oyster-shell scale is found on nearly all kinds of deciduous trees and shrubs, and even occasionally on evergreen species like boxwood. It is one of the commonest pests of nursery stock and occurs particularly on apple, ash, birch, lilac, poplar, walnut (*Juglans*), and willow.

The female shells are long and narrow, more or less curved, and about the same color as the bark. They are shown on Plate III, a, and in Fig. 14. Males are less elongate and much smaller.

There is one generation each year, the insect passing the winter in the form of white, oval eggs under the female shells. These eggs are laid in August and September and hatch the latter part of the following May.

All thoroughly infested trees or shrubs or branches thereof should be removed and burned. The remaining portions should be sprayed while dormant with liquid lime-sulphur (1 - 9) or with a miscible oil (1 - 15). Also a spray of 40 per cent nicotine solution (1 - 500) about June 10 will readily kill the young.

(Report for 1903, page 229).

## INSECTS INJURING FRUIT STOCK

### KEY

#### A. Chewing Insects Devouring Leaves:

1. Forming conspicuous nests or webs ..... 2  
Not forming prominent nests or webs ..... 3
2. Nests in crotches of apple and wild cherry in May,  
Eastern Tent Caterpillar, p. 125  
Nests terminal, July to September.....Fall Webworm, p. 120
3. Caterpillars feeding in clusters on apple ..... 4  
Caterpillars feeding singly on apple ..... 5
4. Striped lengthwise with brown and yellow; with dorsal spines  
and prominent red hump on fourth segment,  
Red-humped Caterpillar, p. 126  
Striped lengthwise with brown and yellow; with slender hairs  
and with yellow cervical shield,  
Yellow-necked Caterpillar, p. 127
5. Caterpillars conspicuously hairy ..... 6  
Caterpillars without prominent hairs ..... 7
6. Gray or brown caterpillars, with hairs not arranged in tufts; five  
pairs of blue spots, six pairs of red spots, Gipsy Moth, p. 122  
Caterpillars with black, white or buff hairs arranged in distinct  
tufts and pencils.....Tussock Moths, p. 121
7. Covered by a thin web on surface of leaf, often curling it,  
Apple and Thorn Skeletonizer, p. 126  
Not covered by web; green or gray, smooth larvae which loop  
in crawling .....Cankerworms, p. 120
8. Bright green beetles with coppery wing-covers,  
Japanese Beetle, p. 127  
Smaller tan-colored beetles with long sprawling legs,  
Rose Chafer, p. 128
9. Brownish, slimy slugs feeding on upper surface of pear and  
cherry leaves .....Pear Slug, p. 129  
Grayish larvae on currant and gooseberry,  
Imported Currant Worm, p. 129

10. Caterpillars injuring buds in spring, devouring apple buds set the preceding summer.....Climbing Cutworms, p. 130
- Gray snout beetle in May devouring buds of the new growth of pear .....New York Weevil, p. 131

#### B. Borers in Trunk or Branches:

11. Large larva, white with black spots, tunneling in trunk or larger branches .....Leopard Moth, p. 120
- Larva white, without black spots, tunneling in apple trees at base of trunk ..... 12
12. With broad head, making gallery under the bark,  
Fiat-headed Apple Borer, p. 131
- With cylindrical head, making gallery in the wood,  
Round-headed Apple Borer, p. 131
13. Burrowing in tender terminal twigs of peach,  
Oriental Peach Moth, p. 132
- Burrowing at base of trunk of peach.....Peach Borer, p. 132
14. Tunneling at base of twigs; brood chambers under the bark;  
small round emergence holes in bark...Shot-hole Borer, p. 133
- Tunnels in pith of currant stems, Imported Currant Borer, p. 134

#### C. Sucking Insects on Leaves, Shoots, or Bark:

15. Greenish aphids on apple leaves and new shoots,  
Green Apple Aphid, p. 134
- Aphids with white wax secretion on apple leaves or bark,  
Woolly Apple Aphid, p. 135
16. Dark brown aphid on cherry, curling the leaves,  
Black Cherry Aphid, p. 136
- Green aphid on currant, blistering the leaves,  
Currant Aphids, p. 136
17. Small, circular, dark gray scale insects on bark, raised nipple in center .....San José Scale, p. 137
- Elongated, curved scales, same color as bark,  
Oyster-shell Scale, p. 123
- Pear-shaped, light gray scales on apple, pear, hawthorn, and mountain ash .....Scurfy Scale, p. 137
18. Active, greenish-white insects on under side of leaves, causing white peppered appearance on upper surface of apple,  
Leaf Hoppers, p. 138
- Grayish bug puncturing tips of new shoots, dwarfing and distorting growth .....Tarnished Plant Bug, p. 139
19. Mites causing blisters on new leaves of apple and pear,  
Pear Leaf Blister Mite, p. 140
- Red mites causing apple leaves to turn brown in midsummer; winters as red eggs on bark.....European Red Mite, p. 140

#### EASTERN TENT CATERPILLAR (*Malacosoma americana* Fabr.)

Makes nests or tents in the crotches of apple and wild cherry trees in early spring, and is often found on pear, peach, and plum. This is a one-generation insect. Caterpillars reach a length of about two inches and are brown, with a white line along the back, more or less blue along the sides and sparsely covered with light brown hairs. They feed outside the nest and leave a strand of

silk wherever they travel along a twig or branch. They reach full size in early June, crawl about for a few days, then under rubbish or in protected places spin white, oval cocoons about an inch long. Two weeks later, emerge the fawn-colored moths which fly at night, mate, and the females during July lay on the twigs clusters of eggs which hatch the following April. These clusters are in the form of cylinders partially or entirely encircling the twigs, and covered with a tough, glue-like substance to protect the eggs. Egg-mass, caterpillars, and nest are shown on Plate III, c, d, and e.

The remedies are: Clip off and burn the egg clusters during the winter; rub off the nests when first formed, and crush the young caterpillars; spray the foliage with lead arsenate.

(Bulletin 177).

FALL WEBWORM. See page 120

APPLE AND THORN SKELETONIZER (*Hemerophila pariana* Clerck)

For the past few years, small, slender caterpillars feeding under webs on the upper surface of apple leaves have been rather common. It is a European pest first appearing in this country in Westchester County, New York, whence it has spread over the New England States, eastern New York and portions of New Jersey and Pennsylvania. There are three generations each year, with a partial fourth in certain seasons. In 1923, nearly all unsprayed apple trees in central Connecticut were skeletonized and brown in July. Since then it has subsided, and though careful search shows it to be present in nearly every orchard, it has done little harm and most of the caterpillars apparently have been either parasitized or eaten by birds, and have not developed to the adult stage. Eggs are laid singly on the under side of leaves. The caterpillars feed at first on the lower surface, but when about one-third grown they move to the upper side and spin a light web across the leaf, often curling it, and feed beneath the web. White cocoons are often made on the leaves. Injured leaf and cocoon are shown on Plate IV, a. Apparently the insect hibernates in the adult form, which is a small brownish or grayish moth, often with purplish tinge. It rests on window-screens with folded wings, forming a triangle, each side of which is about one-fourth of an inch.

This insect is easily controlled by a spray of lead arsenate.  
(Bulletin 246).

CANKERWORMS. See page 120

RED-HUMPED CATERPILLAR (*Schizura concinna* S. & A.)

In late summer, curious caterpillars are often found feeding in clusters on young apple trees, sometimes defoliating them. These



caterpillars reach a length of one and one-half inches and are striped lengthwise with fine lines of yellow, black and white. Spines are borne on the back, but these are longest on the fourth segment, which is dorsally enlarged and a bright coral red, giving the caterpillar its common name. Instead of resting on leaf or stem in the usual position of most caterpillars, the tail end of the body is elevated, as shown on Plate VI, a. The adult is a light brown moth with a wing expanse of over an inch, and there is only one brood each year. The pupae live in the ground over winter.

The caterpillars may be gathered by hand and destroyed, or the foliage may be protected with a spray-coating of lead arsenate. (Bulletin 203, and Report for 1917, page 329).

#### YELLOW-NECKED CATERPILLAR (*Datana ministra* Drury)

Another caterpillar which feeds in clusters on apple trees in nurseries and young orchards in late summer is the yellow-necked caterpillar. When fully grown it is nearly two inches long and is striped lengthwise with yellow and black along the back. Like other caterpillars of the genus *Datana*, when disturbed it elevates head and tail, as shown on Plate VI, b. Head and legs are black and shining, and an orange-yellow cross band next the head gives the insect its name. It is sparsely covered with rather short and weak light brown hairs. Only one generation occurs each year, the winter being passed by the pupae in the ground.

As these caterpillars feed mostly on young trees and in clusters, it is easy to remove and destroy them, or the foliage may be protected by spraying with lead arsenate.

(Bulletin 203, and Report for 1917, page 328).

GIPSY MOTH. See page 122

TUSSOCK MOTHS. See page 121

#### JAPANESE BEETLE (*Popillia japonica* Newman)

This insect from the Orient was first discovered in this country at Riverton, New Jersey, in 1916. Since then it has spread over most of New Jersey, eastern Pennsylvania, western Long Island and Westchester County, New York, into Connecticut as far as Bridgeport, and in 1927 it was found in Washington, D. C., and at several points in Maryland.

There is only one generation each season, and the insect passes the winter as a grub or larva in the soil. The beetles emerge from June 15 to August 15, most of them coming out in July. The grubs feed upon grass roots, and the beetles devour the foliage and fruit of most kinds of fruit trees, the foliage of many shade

trees and ornamental shrubs, as well as the flowers and leaves of many annual and perennial plants. Nursery plants with soil on the roots are liable to contain larvae, and if not treated, they may be transported in this manner. The beetle, egg and grub are shown in Fig. 15, and beetles and rose leaves injured by them are shown on Plate IV, b. and c.

The remedies are: treating the soil with carbon disulphide emulsion; spraying the foliage with coated lead arsenate; spraying the beetles with oleoresinate of pyrethrum. It is a difficult pest to control.

(Report for 1926, page 244).

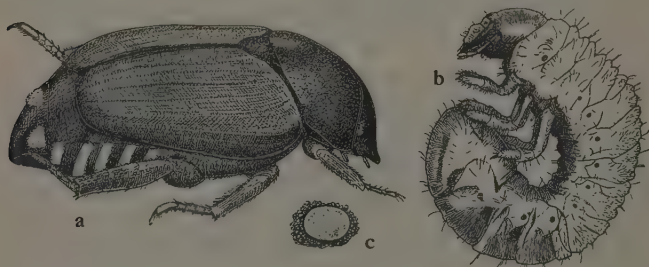


FIG. 15. The Japanese beetle. a, adult beetle; b, grub or larva; c, egg. All enlarged about five times.

#### THE ROSE CHAFER (*Macrodactylus subspinosus* Fabr.)

The rose chafer occurs from Canada south to Virginia and Tennessee and west to Colorado and Oklahoma. The region of its greatest abundance, and therefore of its greatest destructiveness, is in southern New England and the Middle Atlantic States.

The injury to the foliage and fruit is done by the adult beetle. The rose chafer is a yellowish-brown beetle about one-third of an inch long and with long sprawling legs. The larva or grub is yellowish-white with pale brown head; it lives in the ground and is rarely seen. The adult beetles feed upon the leaves of a number of plants, as well as flowers and fruit. They are very fond of grape blossoms and newly set fruit, often destroying the entire crop. Roses and peonies, especially the light-colored varieties, are often ruined by this insect. In nurseries grape leaves are sometimes partly eaten. Hydrangeas were injured quite severely in 1927. The work of this insect is shown in Fig. 16, and on Plate V, a.

The beetles emerge from the ground and attack the plants usually about the second week in June in Connecticut. Soon after emerging, the beetles mate, and the female lays her eggs singly in

the ground, usually depositing from 24 to 36 eggs. These eggs soon hatch, and the young larvae feed on the roots of grass and other plants until fall, when they descend deeper into the soil below the frost line. In the spring the grubs ascend, transform to pupae in earthen cells, and the beetles emerge two to four weeks later.

The rose chafer is an exceedingly difficult insect to control by ordinary measures. The best remedy known is to cover the foliage with a heavy application of arsenate of lead. In vineyards, hand picking is sometimes recommended to protect the blossoms



FIG. 16. Rose chafer.

and newly set fruit from being eaten by this insect. In New Jersey, self-boiled lime-sulphur is an effective repellent on fruit trees.

(Report for 1916, page III).

#### THE PEAR SLUG (*Eriocampoides limacina* Ratz.; *Caliroa cerasi* Linn.)

In late summer the leaves of pear stock are often eaten by soft, slimy, brown, slug-like worms which feed upon the upper surface. Cherry leaves are likewise injured. This has been called the cherry and pear slug, and several scientific names have also been applied to it. It is the larva of a sawfly, and there are two generations each season. This insect is shown in Fig. 17.

The pest is easily controlled by spraying or dusting with lead arsenate or fresh hellebore.

(Report for 1920, page 199).

#### IMPORTED CURRANT WORM (*Pteronidea ribesi* Scop.)

This insect often defoliates currant and gooseberry bushes in nurseries. The adults of the currant worm spend the winter months in the ground and emerge during the latter part of April or early May. They lay their eggs on the under side of the leaves. In about a week or ten days the eggs hatch, and the young larvae

begin to feed on the tender leaves. After they are full grown, they enter the ground and spin small brown cocoons, from which the adults for the second brood emerge. Shown in Fig. 18.

The control measures for this insect are very simple. Usually one application of arsenate of lead, either in the form of dust or spray, will hold it in check. If the fruit is to be picked and sold, it is better to dust the plants with hellebore, as this soon washes off and is not so poisonous to man as arsenate of lead.

(Report for 1902, page 170).

### CLIMBING CUTWORMS

Apple trees in nursery rows and in newly set orchards have been injured in Connecticut by climbing cutworms. In May, 1925, on apple stock in Durham, the buds which had been set the preced-



FIG. 17. Pear slug. a, adult sawfly, female; b, larva with slime removed; c, larva in normal state; d, leaves and larvae, natural size; a, b, c, much enlarged. (After Marlatt, Circular 26, Division of Entomology, U. S. Department of Agriculture).

ing summer were eaten off (see Plate VI, c), and raspberry plants near by had also been stripped. Two species of cutworms were responsible, and when reared, the adults proved to be *Agrotis unicolor* Walker (formerly *Noctua clandestina* Harris) and *Noctua fennica* Tausch. In May, 1926, similar injury occurred on grafts set in young orchard trees in Wallingford, and was caused by the dingy cutworm, *Feltia subgothica* Haworth. In May, 1922, raspberries in East Haven were injured by cutworms, and from the material two moths were reared, *Paragrotis messoria* Harris and *P. tessellatus* Harris. The same season larvae of *Noctua c-nigrum*

Linn. injured strawberry plants in a field near New Haven. As the injury is seldom noticed until too late, treatment is ineffective. In certain cases a liberal application of lead arsenate may protect the plants.

(Bulletin 247, and Report for 1922, pages 373, 375; Bulletin 275 and Report for 1925, page 324; Bulletin 285, and Report for 1926, page 276).

#### NEW YORK WEEVIL (*Ithycerus noveboracensis* Först.)

Though the injury is not common, occasionally young pear and plum trees are injured by this weevil, which eats into the bases of new shoots, sometimes nearly severing them. In a young orchard in Wallingford in 1908, injury by this weevil was quite prominent

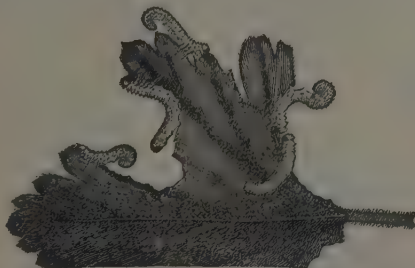


FIG. 18. Imported currant worm.



FIG. 19. Round-headed borer.

the last week in May. The insect is a snout beetle about half an inch in length, gray or slightly reddish, marked with quadrate black spots.

Spraying with lead arsenate proved an effective remedy. (Report for 1908, page 845).

LEOPARD MOTH. See page 120

#### APPLE TREE BORERS

There are two common species of borers which attack apple trees in Connecticut. They are known as the flat- and round-headed borers.

The round-headed borer, *Saperda candida* Fabr., usually attacks the main trunk of the trees near the base. The adult is one of the long-horned beetles and may be easily recognized by two straight white lines running lengthwise on its back (see Fig. 19). The eggs are laid during the summer, and the young borers tunnel just



under the bark until winter. The following year they tunnel into the sapwood and the third year feed directly in the solid wood. By this time the borers are quite large and do much damage to young trees, often killing them. The best remedy is to cut them out with a knife. Often a wire with a barb near the end is very useful to push into the tunnels and draw out the borers. The insect sometimes attacks other trees beside apple, quince being a favorite host, as well as *Crataegus* and mountain ash. The presence of borers may be noted by sawdust on the ground at the base of trees, which the borers have pushed from their burrows.

(Report for 1907, page 333).

The flat-headed apple tree borer is the larva of a Buprestid beetle, *Chrysobothris femorata* Fabr. As a rule, this insect attacks only trees that have been weakened by some other cause. It attacks a large variety of trees and has often been found in dry cordwood.

The borer seldom produces any visible castings, but its presence may be noted by a darkened and depressed area over the gallery. The larva when full grown is about an inch long and has a broad, flat head, from which it derives its name. It normally lives but one year in the tree, although under certain conditions it may live two years.

The remedy is to cut out borers when found and to keep trees in good condition by proper cultivation and fertilization.

(U. S. Farmers' Bulletin 1270, page 73).

#### ORIENTAL PEACH MOTH (*Laspeyresia molesta* Busck)

This pest from the Orient is believed to have been brought into the United States on flowering cherries from Japan and has now spread throughout the Atlantic States as far north as Massachusetts and as far west as the Mississippi River. It has also been found in Ontario, Canada. There are three generations each season, and the larvae live through the winter in inconspicuous cases on the bark. The larvae tunnel in the twigs (see Plate V, b), causing the tips to die and the lateral buds to develop and form thick bushy tops. Though primarily an orchard pest, it often attacks nursery trees. No good remedies are known.

(Reports for 1925, page 280; 1926, page 234).

#### PEACH BORER (*Synanthedon exitiosa* Say)

The adult of the peach borer is a wasplike moth. It lays its eggs in midsummer, and the borers hatching from them live in the trunks and often the larger roots until the following June or July, when they pupate in their burrows. The adults emerge to lay eggs for the next generation. This borer is shown on Plate VI, d.

The only satisfactory remedy on nursery trees is to cut open the burrows and kill the borers. A small piece of wire is very useful to insert into the burrows to pull the borers out, saving considerable cutting of the trunk of the tree. The injury may easily be seen by masses of gum at the base of the tree. This gum is often full of small particles of wood which the borer pushes from the burrow. Older peach trees may be treated with paradichlorobenzene, but this treatment is not safe on nursery trees.

(Report for 1909, page 359).

#### SHOT HOLE BORER (*Scolytus rugulosus* Ratz.)

This insect attacks most of the fruit trees which are normally grown in Connecticut. The injury is caused by the larva of a small beetle which lays its eggs under the bark of weakened and sickly trees, rarely attacking vigorous, healthy trees. The eggs

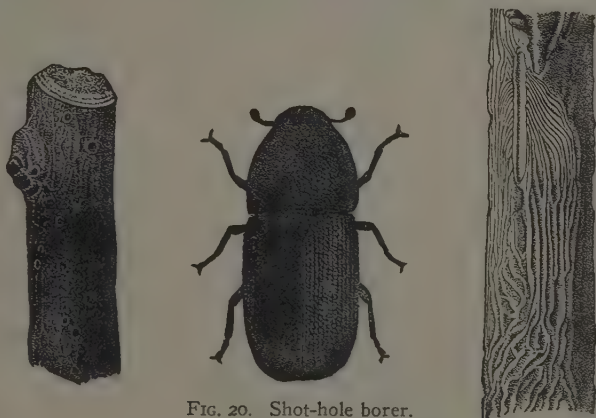


FIG. 20. Shot-hole borer.

hatch into small white grubs which bore just under the bark and slightly into the wood. The larvae live over the winter in these galleries and during the following summer transform to the adult stage and emerge from the trees, leaving small round holes in the bark. The bark of the infested trees looks as though it had been riddled by shot, and this fact gives the insect its common name. Occasionally the beetles tunnel at the base of small twigs, which may weaken the tree to such an extent that the grubs may live under the bark. This insect is shown in Fig. 20.

The only remedy is to cut out infested trees or branches and burn. Much can be done to prevent injury by removing sickly trees in or near the nursery and keeping all fruit stock in a vig-

orous growing condition by the application of nitrogenous fertilizer and by cultivation.

### IMPORTED CURRANT BORER (*Sesia tipuliformis* Clerck)

The adult is a clear-wing moth which appears in June, and the female lays eggs singly on the bark. The young larvae enter the stem and bore upward or downward in the pith, killing the stem. They are nearly full grown when winter approaches and hibernate in the burrows. The following May, each larva tunnels outward but leaves the burrow covered by a thin layer of bark. It then pupates in the burrow, and in June the moth emerges, leaving the pupa skin projecting from the cavity. There is only one brood each season. Infested canes appear sickly and should be cut off and burned before June 1 to kill the borers before the moths emerge.

(Fruit Insects, page 339).



FIG. 21. Green apple aphid. Eggs on twig; aphids on leaf.

### GREEN APPLE APHID (*Aphis pomi* De G.)

This insect probably causes more injury to apple trees in the nursery than any other insect attacking apple trees in Connecticut. This was particularly true during the early summer of 1927, when these insects were very numerous and caused much injury by stopping growth and distorting young apple trees in Connecticut nurseries.

The insect passes the winter in eggs laid on twigs. The eggs are yellowish-green when laid, becoming glossy black. The young aphids hatch early in the spring, as soon as the buds begin to open, and start to feed on the young, unfolding leaves. No eggs are laid during the summer generations, the young aphids being born alive, and are ready to feed immediately. There are from 9 to 17 broods

produced during the season, following which the sexual individuals appear and deposit the overwintering eggs. This aphid is shown on Plate VII, b, and in Fig. 21.

Thorough spraying of the trees when the buds are opening in spring, using lime and sulphur at the rate of one part to nine parts of water, plus one pint of nicotine sulphate to every one hundred gallons of water, will be found of great value. Some of the miscible oils are also very good for this purpose, if the directions of the manufacturers are followed. Spraying at this time with either of these sprays will also help in the control of San José scale. During the summer, after the leaves have become curled, it is almost impossible to hit the aphids with any sprays. It is therefore necessary to dip the tips of the branches—where most of the aphids are found—in a pail of spray material consisting of one pint of nicotine sulphate to one hundred gallons water. It is very important that about four pounds of soap, previously dissolved in hot water, be added to the mixture. Other aphids may often be found on apple stock, but the above treatment is effective on all kinds of plant lice.

#### WOOLLY APPLE APHID (*Eriosoma lanigerum* Haus.)

This aphid differs from other aphids in the fact that it attacks its host plants both above and below the ground, and those that are above ground are covered by a white wax secretion resembling cotton (see Plate VII, c). These aphids often cluster in wounds, such as scars, cankers, and other injuries. The root form of this insect causes the roots to be deformed and covered with small galls.

The life history of this aphid is rather intricate but may be briefly outlined as follows: The eggs are laid in the crevices of the bark on elm trees in September and hatch in early spring. The aphids hatching from these eggs are wingless females and their young are also wingless, but the next brood produces winged adults which migrate to apple and sometimes to pear, quince, mountain ash and *Crataegus*. There are three summer broods, and in August winged females appear which migrate back to elm and lay winter eggs.

The aerial form may be controlled by spraying with kerosene emulsion or with nicotine sulphate and soap. The underground forms are harder to kill, as it is almost impossible to make spray permeate the ground sufficiently to kill the aphids. Carbon disulphide emulsion has been used with some success. One-half pound of carbon disulphide emulsion in four gallons of water poured into a shallow trench around the trees will kill the underground forms.

(Report for 1924, page 308).

### BLACK CHERRY APHID (*Myzus cerasi* Fabr.)

The black cherry aphid is often very abundant on sweet cherry stock in nurseries. It is a black insect with a rounded abdomen, giving it a more or less globular appearance.

The eggs are laid upon cherry twigs in the fall and hatch early in the spring, often before the cherry buds open. They are able to withstand freezing, and as soon as warm weather comes and the buds open, they begin to feed and reproduce. This usually takes place in two or three weeks. Later broods become mature in less than a week. Some of the individuals of the later broods become winged and migrate to pepper grass, where they continue to reproduce until fall. They then migrate back to cherry and lay the overwintering eggs. Not all of the aphids migrate from cherry, and some can usually be found on it all summer, although during the latter part of the season they may not be very plentiful.

Control measures given for green apple aphids will be found useful for the cherry aphids. (See page 135).

(U. S. Farmers' Bulletin 1128, page 20).

### CURRENT APHIDS

There are several species of aphids causing injury to currant foliage. Their life histories are very similar and the same control measures would be equally effective on all species.

Perhaps the most common species in Connecticut is called the currant aphid, *Myzus ribis* Linn., which causes the terminal leaves to become much distorted, and little pits or pockets are formed on the under side of the leaves. The upper surface becomes more or less reddish in color, which is noticeable some distance away. When plants are heavily infested, these leaves fall, causing the plants to make a poorer growth.

The stem mothers hatch from eggs on currant twigs soon after the leaves develop in spring. Some of the young from the stem mothers develop wings and migrate to motherwort, hedge-nettle, and other related plants. The wingless forms remain on currants and continue reproduction. In each generation some winged individuals appear which migrate, but wingless forms are found on bushes until late summer. Early in October, migrants return and deposit the sexual females, which, when mature, mate with the winged males, and eggs are laid upon the twigs.

Spraying with nicotine sulphate and soap when the buds are opening will kill the stem mothers, or a later spray of the same material, directed upward to hit the aphids on the under side of the leaves, will hold the insects in check.

(U. S. Farmers' Bulletin 1128, page 28).



SAN JOSÉ SCALE (*Aspidiotus perniciosus* Comst.)

A number of years ago this insect was considered one of the most destructive scales infesting nursery stock. It is thought to have been introduced from China and was first found in this country in San José, California, about 1870. Since that time it has been spread through the principal fruit and nursery districts of the United States.

The general use of dormant and summer sprays, together with its natural enemies, has so reduced its numbers that it is not considered so serious a menace as formerly. Occasionally, however, nursery trees are nearly killed by this insect. This is particularly true of fruit stock which has been heeled in for a few years; it invariably becomes infested with scale and must be destroyed. Apple, pear, and peach trees are its favorite food plants, but other fruit trees, as well as shrubs and shade trees, are often attacked.

The scale or covering beneath which the insect lives is circular, about the size of a pin-head, grayish in color, with the central portion raised, and is shown in Fig. 22, and on Plate VII, a.

The best method of control is to spray the trees while dormant with a lime-sulphur solution, using one part to nine parts of water, or with one of the many miscible oils now on the market, following the manufacturer's directions.

(U. S. Farmers' Bulletin 1270, page 62).

OYSTER-SHELL SCALE. See page 123

SCURFY SCALE (*Chionaspis furfura* Fitch)

Apple and pear trees, as well as other common deciduous trees and bush fruits, are often attacked by the scurfy scale, which retards the growth and sometimes causes the death of the trees if the infestation is severe. This insect is a native of the United States, but is most common in the New England and Middle Atlantic States. It is easily recognized by its dirty-white color and pear-shaped scale in the female, and the white elongated scale of the male, as shown on Plate VII, f.

The insect winters in the egg stage, the eggs being found under the female scales. The eggs and the young scales are purplish, tinted with red, and hatch the last week of May. In the North there is but one brood each season, but farther south there may be two or three broods.

A dormant spray of lime and sulphur, or a miscible oil, applied as for San José scale, will usually control the scurfy scale.

(U. S. Farmers' Bulletin 1270, page 65).

## LEAF HOPPERS ON APPLE

There are two species of leaf hoppers commonly found on apple stock in Connecticut nurseries. They are quite similar in appearance but their life histories, as well as the injury they cause to growing apple trees, are quite different.

The leaf hopper causing the most injury to young apple trees is known as the apple leaf hopper, *Empoasca mali* LeBaron, shown in Fig. 23. The other is commonly known as the rose leaf hopper, *Empoa rosae* Linn. The injury caused by the former is very noticeable on young trees, where it attacks the tender terminal leaves, causing them to become reduced in size, curled, and misshapen. The effect of feeding by the insects is to make the tips and edges of the leaves brown and dry.



FIG. 22. San José scale.

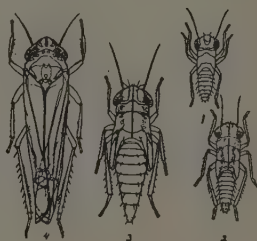


FIG. 23. The apple leaf hopper, in its different stages. (After Washburn, 9th Report State Entomologist of Minnesota).

The life history of the apple leaf hopper is as follows: The adults pass the winter under fallen leaves or any other convenient shelter. When the weather becomes warm in the spring, they leave their hibernating quarters and go to the young apple leaves to feed. Later the eggs are laid under the lower epidermis of the leaves and hatch in a short time. Three generations are produced each year, the last one hibernating.

The so-called rose leaf hopper makes the apple leaves appear more or less stippled or mottled. Leaves seriously infested by this insect are unable to function properly, and in extreme cases fall to the ground, interfering with the proper growth of the trees.

This insect is believed to have been introduced from Europe, perhaps on nursery stock, and is now widely distributed throughout the United States. Among its food plants, besides apple, are grape, raspberry, currant, gooseberry, blackberry, elm, oak, and others, though rosaceous plants are preferred.

The leaf hopper passes the winter in the egg stage. The eggs are deposited beneath the bark of apple and rose, producing tiny, raised, blister-like spots. They hatch in early spring, and the young are mature early in summer. The eggs for the second brood are deposited in the veins of the leaves. There are two broods each season.

Control measures are the same for both species: A spray of one pint of nicotine sulphate in a hundred gallons of water in which four pounds of soap have been dissolved will be found very effective if applied when the first generation is still young. The spray must strike the underside of the leaves where the young leafhoppers feed.

(U. S. Farmers' Bulletin 1128, page 26).

#### TARNISHED PLANT BUG (*Lygus pratensis* Linn.)

This insect injures peach stock by puncturing the tip of the tender new shoots, sucking out the juices, and probably injecting

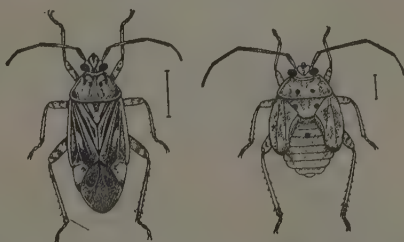


FIG. 24. Tarnished plant bug: adult at left: last stage of nymph at right. Enlarged about four times. (After Chittenden, Bulletin 43, Bureau of Entomology, U. S. Department of Agriculture).

some poisonous substance into the tissues, which soon die. This injury is called "stop-back" or "bush-head." Pear and apple trees, and many flowering plants are also injured by the tarnished plant bug. The female lays eggs in the tender shoots or in the petioles or veins of the leaves. The young bugs are yellowish-green and pass through five stages before the mature winged form appears. Both nymph and adult are shown in Fig. 24. There are probably several generations each year, and all stages may be found from May until November.

All weeds and rubbish around the field should be destroyed by burning or plowing. Spraying heavily with nicotine solution and soap will probably kill the nymphs.

(Missouri Bulletin 170, page 17).

PEAR LEAF BLISTER MITE (*Eriophyes pyri* Pag.)

The pear blister mite attacks the foliage of apple and pear but rarely causes any serious injury to apple foliage. On pear it is often a serious pest, causing a slowing up of tree growth, making undersized pear stock. It produces on the foliage small reddish or greenish galls or blisters which, after a time, turn brown, spotting the leaves with dead areas, as shown on Plate VII, e. When the galls are abundant, the tissues become dead, and the injured leaves have a brownish, shriveled appearance and often drop.

This mite is of European origin, but is now widely distributed wherever pears are grown.

The winter is passed in the adult stage under the bud scales. The adults are very small, elongate, whitish insects. In spring when the leaves are unfolding, the mites enter the leaves through the lower epidermis, and their activities soon produce their characteristic galls, in which they live and multiply. After reaching maturity, the mites desert the old galls, make new ones, and produce a new generation. The process continues until cold weather, when the adults migrate to the bud scales for the winter.

Spraying while the trees are dormant with lime-sulphur solution as for San José scale will hold this mite in check. Summer sprays are of doubtful value, the mites being inside the leaves and protected from the action of the sprays.

(Report for 1910, page 700).

EUROPEAN RED MITE (*Paratetranychus pilosus* Can. & Fanz.)

The work of the European red mite was first noticed on orchard trees in Connecticut in 1920. Since then it has caused considerable injury to orchard trees throughout the State.

The presence of mites on the foliage is usually indicated by the leaves turning brown, if the infestation is severe. A light infestation gives the foliage a sickly color and interferes with the proper functioning of the leaves.

The mite has been found on apple, cherry, plum, peach, pear, rose, and elm, although most of the real injury in Connecticut has been noticed on apple.

The eggs of the European red mite may be found on the branches and twigs of infested trees during the late fall and winter, as are shown on Plate VII, d. They are reddish in color and .15 mm. in diameter. When plentiful, they give the twigs the appearance of being covered with brick dust. The eggs hatch during the latter part of April or early in May, and the young mites make their way to the young leaves, where they begin to feed. They reach maturity in about three weeks and begin to lay eggs for the next brood. There are several broods in a season.

•

The best-known remedy is to spray in early spring, just before the eggs hatch, with one of the miscible oils. Lime-sulphur may be used, but is not as effective as an oil spray. Care must be taken to spray thoroughly, hitting all the eggs. If many of the eggs are missed in spraying, they will hatch and breed fast enough, under favorable conditions, to give rise to a serious infestation later in the summer. If mites become plentiful during the summer, a spraying of linseed oil emulsion will be effective, using one gallon of linseed oil and one and one-quarter pounds of soap to one hundred gallons of water.

(Bulletin 252).

## INSECTS INJURING DECIDUOUS SHADE AND FOREST TREES

### KEY

#### A. Feeding upon the leaves:

1. Mining in leaves of larch.....Larch Case Bearer, p. 142  
Mining in leaves of locust.....Locust Leaf Miner, p. 143  
Making blotch mines in birch leaves,  
Imported Birch Leaf Miner, p. 143
2. Skeletonizing the leaves ..... 3  
Devouring the leaves, except the larger veins ..... 5
3. On poplar and willow ..... 4  
On birch .....Birch Skeletonizer, p. 144  
On elm .....Elm Leaf Beetle, p. 144
4. Small, dark blue or green beetles; mostly bright green, 2-4 mm.  
long .....Willow Flea Beetle, p. 145  
Mostly dull blue, 4-5 mm. long,  
Imported Willow Leaf Beetle, p. 145  
Larger beetles, 7-10 mm. long, light brown, marked with black  
longitudinal lines, on poplar...Cottonwood Leaf Beetle, p. 145  
Marked in the form of irregular black dots,  
Spotted Willow Leaf Beetle, p. 145
5. Forming webs or nests ..... 6  
Not forming webs or nests ..... 7
6. Large loose webs on ends of branches in late summer,  
Fall Webworm, p. 120  
Small close webs on twigs of poplar....Poplar Tent Maker, p. 146
7. Feeding upon broad-leaved deciduous trees ..... 8  
Devouring leaves of larch.....Larch Sawfly, p. 146
8. Larger, hairy caterpillars, non-loopers ..... 9  
Smaller, smooth caterpillars which loop in crawling,  
Cankerworms, p. 120
9. Conspicuously marked with black, white, or yellow tufts of hairs,  
Tussock Moths, p. 121  
Caterpillars gray or brown, with two rows of dorsal tubercles;  
first five pairs blue, remaining six pairs red..Gipsy Moth, p. 122



## B. Tunneling in the Wood:

10. Larvae white, without legs ..... 11  
Larvae white with dark brown spots, with legs,  
Leopard Moth, p. 120
11. Round-headed larvae ..... 12  
Flat-headed larvae in white birch.....Bronze Birch Borer, p. 147
12. Tunneling in base of linden.....Linden Borer, p. 148  
Tunneling anywhere in trunk of black locust, Locust Borer, p. 148  
Tunneling in trunk and branches of poplar and willow,  
Poplar and Willow Borer, p. 149

## C. Sucking Insects:

13. Green or white, woolly plant lice, visible on leaves ..... 14  
Small red objects, hardly visible on leaves.....Mites, p. 150
14. Green plant lice on leaves.....Green Aphids, p. 150  
White woolly plant lice on beech leaves,  
Beech Woolly Aphid, p. 151
15. Scale insects fixed on bark ..... 16  
Large brown plant lice on bark of twigs ....Willow Aphids, p. 151
16. Hemispherical or globular, brownish or greenish scale insects on  
twigs ..... 17  
Pear-shaped, white, gray or brownish scales ..... 21
17. Scales hemispherical ..... 18  
Scales globular, on oak .....Oak Gall Scale, p. 151
18. Scales brown, without white wax secretion ..... 19  
Scales brown, with conspicuous secretion of white wax ..... 20  
Scales greenish-yellow, in pits on the bark of English oak,  
Pit-making Oak Scale, p. 151
19. Scales large (6-8 mm.) on tulip tree.....Tulip Tree Scale, p. 152  
Scales small (2-6 mm.), reddish-brown, on maple,  
Terrapin Scale, p. 152  
Larger than preceding, often clustered on many different kinds  
of trees and shrubs .....European Fruit Lecanium, p. 123
20. Chocolate brown with white wax fringe in crevices of bark on  
elm .....European Elm Scale, p. 153  
Medium brown on twigs of maple; white ovisac develops and  
becomes very prominent under posterior portion of body,  
Cottony Maple Scale, p. 153
21. Gray or dirty white on elm twigs.....Elm Scurfy Scale, p. 154  
Gray or brownish, often same color as bark, on a great variety  
of trees and shrubs.....Oyster-shell Scale, p. 123

LARCH CASE BEARER (*Coleophora laricella* Hubn.)

The young larvae of the larch case bearer tunnel out the outer half of each needle, and when it is completely hollowed out, cut it off at the base of the excavated portion and use the latter as a case, living in it and carrying it about while feeding. They spend the winter in these cases, fastening them to the twigs by silken threads. When warm weather comes in the spring, the larvae dislodge their cases and migrate to the leaves, upon which they feed. They also cut off other needles to enlarge their cases and continue to do this until May, when they pupate within the cases. The adults

emerge the latter part of May and lay their eggs upon the leaves during the early part of June. The adult is a small moth with a wing expanse of about 9 mm. It is silvery grayish-brown in color with narrow front and rear wings having a long fringe.

There is no practical method of controlling this insect in forests or large plantations, but on shade or ornamental trees spraying is effective. If the trees are sprayed with lime-sulphur at the rate of one part to seven parts of water before the new leaves start in the spring, many larvae will be killed in their hibernating quarters. Spraying with arsenate of lead seems to have no effect upon this insect.

(Report for 1923, page 288).

#### LOCUST LEAF MINER (*Chalepus dorsalis* Thunb.)

The adult of this insect is a beetle about one-fourth of an inch in length, with head, legs, and an area along the middle of the wing-covers, black; the thorax and remaining portion of the wing-covers are orange-red.

The eggs are laid on the under sides of the leaves in May, and the larvae are miners within the leaves, and pupate there. The beetles emerge from the mines in July and fly about, soon laying eggs for the second brood, which reaches maturity in the fall. The beetles hibernate under the dead bark of trees, cracks and crevices, and under rubbish. Though the black locust is the preferred food plant and is therefore the most severely injured, this insect also attacks dogwood, elm, oak, beech, cherry, and several other species of trees.

Locust trees may be protected from this insect by spraying with lead arsenate to which a little molasses has been added.

(Ohio Bulletin 332, page 231).

#### IMPORTED BIRCH LEAF MINER (*Fenusa pumila* Klug)

The adult of this insect is a small black sawfly which has somehow been introduced from Europe. First noticed in Connecticut in 1923, the adults were reared and identified in 1924, and the insect has now spread throughout New England and eastern New York. There are apparently three generations each year, the winter being passed as pupae in the ground. The larvae make blotch mines on the tender or terminal leaves, as are shown on Plate VIII, a, especially on sprouts or low trees of the gray birch, the paper birch, and the European white birch. Several larvae in a leaf unite in mining the entire leaf. No remedy is known.

(Report for 1924, page 340).

BIRCH SKELETONIZER (*Bucculatrix canadensisella* Chambers)

This is a native American insect of periodical abundance, and there is an annual generation which hibernates in ribbed cocoons on old leaves on the ground. The adult moths emerge and lay eggs in June and July. The eggs hatch in 15 days, and the young larvae for the first three instars (on the average, about four weeks) mine in the leaves. They then emerge and feed upon the under side of the leaves, skeletonizing them. They molt in white, circular or oval flattened cases on the leaves. The chief food plants are the gray, paper, yellow, and European white birches. The larvae and their work are shown on Plate VIII, b.

The remedy is to spray with lead arsenate.  
(Bulletin 288).

ELM LEAF BEETLE (*Galerucella xanthomelaena* Schr.)

The work of the elm leaf beetle is found in the nurseries of the State nearly every year. Some seasons it is serious and must



FIG. 25. Larvae and work of the elm leaf beetle.

interfere with the growth of the trees. It is another insect of European origin but has been in this country for nearly ninety years, and is distributed generally throughout the eastern United States. In the early nineties many fine old elms were destroyed by this beetle in southern New England.

The beetles live over the winter in houses, barns, church bell-fries and out-buildings. They leave their winter quarters in early spring, mate, and, as soon as the leaves unfold, eat small round holes in them. In May or early June, the females lay small clusters of yellowish eggs on the under side of the leaves. Each female may lay five or six hundred eggs. In about a week the eggs hatch and the young larvae or grubs feed on the under side of the leaves, as shown in Fig. 25, and on Plate IX, b, become

full grown in about three weeks, and crawl down the trees to pupate on the ground. The pupa stage lasts about ten days. Then the adult beetles emerge and lay eggs for the second generation, which seldom does much damage in Connecticut, and go early into winter quarters.

There is no reason why this insect should be a serious pest in nurseries because it is easily killed by an application of arsenate of lead spray, using two pounds to fifty gallons of water. The best time to apply this is soon after the eggs have hatched, which is around the first of June.

(Bulletin 155).

#### WILLOW FLEA BEETLE (*Crepidodera helxines* Linn.)

This is a small, bright green or occasionally blue, metallic, jumping beetle, with rather prominent punctures on the wing-covers, and about one-tenth of an inch in length. It is often rather abundant on willows in nurseries, and the beetles eat many round holes in the leaves. It lives through the winter in the adult stage, but its life history is not well known. Spraying the foliage with lead arsenate is the remedy.

(Kentucky Bulletin 120, page 61).

#### IMPORTED WILLOW LEAF BEETLE (*Plagioderia versicolora* Laich.)

This insect has recently become established in the United States in the vicinity of New York City. It was first found in Connecticut at Greenwich in 1921. At that time the beetles and larvae were quite numerous and were defoliating willows. Since then the insect has spread over the State and can be found in nearly all nurseries where willows are grown. The beetles appear late in April or early May and feed for some time; then deposit eggs. The beetles are moderately stout, about one-eighth of an inch long, and of a dark, metallic-blue color. When the eggs hatch, the young, bluish-black grubs feed on the under side of the leaves, often skeletonizing them. This insect and its work is shown on Plate IX, c.

Spraying with lead arsenate is effective.

(Report for 1921, page 195).

#### COTTONWOOD LEAF BEETLE (*Lina scripta* Fabr.), SPOTTED WILLOW LEAF BEETLE (*Lina lapponica* Linn.)

These insects are well-known pests of poplars and willows. In Connecticut most of the injury is done to Lombardy and Carolina poplars. Both species of beetles cause injury, but *Lina scripta* is the more common in this State.

The life history, habits, and the control measures are about the same for both species, so they may be treated together in this paper.

The beetles appear early in the spring when leaf growth starts, and begin to feed on the foliage. In a short time oviposition takes place, and the reddish-yellow eggs are laid in clusters on the under side of the leaves. From these hatch small black grubs which skeletonize the under surface of the leaves. As they grow larger they eat out ragged holes in the leaves and often leave only the midribs. When full grown they pupate on the leaves and soon the adults emerge. There are three broods in a season.

Spraying with arsenate of lead, using three pounds to a hundred gallons of water, will control this pest. An effort should be made to spray the under side of the leaves, as the young grubs feed only on the lower surface until they are about half grown. The smooth surface of the poplar and willow leaves causes the spray to roll off or collect in drops, but this may be overcome by adding a spreader like calcium caseinate, mixing one pound with a hundred gallons of the spray mixture.

(Ohio Bulletin 332, pages 259, 261).

FALL WEBWORM. See page 120

#### POPLAR TENT-MAKER (*Melalopha inclusa* Hubn.)

The caterpillars feed gregariously upon the foliage of various kinds of poplars and willows and make small nests upon the twigs which resemble those of the brown-tail moth. Unlike them, however, the caterpillars do not remain in the webs through the winter.

There are probably two generations each year, as the moths are present in March, April, and May, and again in July and August. The full-grown caterpillar is about an inch and a half long, dark brown, with narrow yellow stripes extending lengthwise. The head and legs are black, the under surface of the body honey-yellow. The fourth and eleventh segments each bear a closely set pair of high, pointed tubercles dark brown in color and somewhat hairy.

Spraying with lead arsenate is the remedy.

(Report for 1911, page 310).

#### LARCH SAWFLY (*Lygaeonematus erichsoni* Hart.)

The larch sawfly was first noticed in this country in Massachusetts in 1881. Since that time it has caused considerable injury to larch plantations. In Connecticut it has been reported from the



northern parts of the State where larch grows naturally. Both the adults and the larvae injure trees, the adults injuring the terminal twigs by inserting eggs, and the larvae eating the leaves. The adult female selects the young, green, terminal shoot in which to deposit eggs, causing it to die or severely injuring and distorting it. The eggs are laid in May and hatch in about ten days. The young larvae feed on the leaves and are full grown in three or four weeks. They then make cocoons under rubbish on the ground, where they spend the winter. The adults emerge the following spring. Larvae and cocoons are shown on Plate IX, a.

On small trees in nurseries, injury may be prevented by spraying with three pounds of arsenate of lead in fifty gallons of water. In woodlands the insect is hard to control because of the size of the trees and the difficulty in spraying. In Connecticut the best time to spray is early in June soon after the eggs have hatched.

(Report for 1915, page 125).

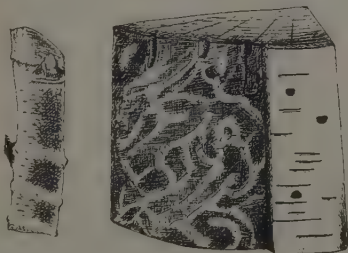


FIG. 26. Work of the bronze birch borer.

CANKERWORMS. See page 120

TUSsock MOTHS. See page 121

GIPSY MoTH. See page 122

LEOPARD MoTH. See page 120

#### BRONZE BIRCH BORER (*Agrilus anxius* Gory)

Many cut-leaf white birches in Connecticut have died during the past few years as a result of the attack of the bronze birch borer. The European white birch, *Betula alba*, is the species chiefly injured. Our native birches are seldom, though occasionally attacked by the insect.

Thinning of the foliage in the top of the tree is an indication of the presence of the borer. Later, the top branches die, and the following season the process continues until the tree is killed. A careful examination shows ridges or swellings on the branches one-half to one inch in diameter before anything is wrong with the foliage. Where the beetles have emerged there may be semi-circular exit holes. Injured wood is shown in Fig. 26.

There is one annual generation each year. The larvae live through the winter in cells just under the bark and pupate early in May. The beetles emerge late in May or early in June and lay eggs in the crevices of the bark. The small larvae hatching from the eggs tunnel first near the bark and, as they grow larger, into the wood.

Infested trees should be cut and burned before June 1 to prevent the flight of the beetles from infested trees to healthy ones. As the adults feed to some extent upon the foliage, spraying with lead arsenate early in June is recommended.

(Report for 1922, page 359).

#### LINDEN BORER (*Saperda vestita* Say)

This insect often causes serious injury to young linden trees. In nurseries many have been injured at the base so that they break in wind-storms. See Plate X, b.

The adult beetle is black, covered by a dense olive pubescence, and usually has three black spots on each wing-cover, though these are sometimes absent. The beetles appear during the summer and after feeding on the green bark of growing shoots, leaf stems, and on the under side of leaves, they begin to lay their eggs. The females with their jaws make slight incisions in the bark where they lay their eggs. The grubs on hatching mine under the bark and into the wood. The injury takes place at or near the ground—never more than a foot from it—and sometimes in the larger roots.

The only remedy is to kill the borers. This may be done with a pointed knife or a wire. The borer may be extracted by means of a small wire with a barbed point like a harpoon.

(Report for 1915, page 186).

#### LOCUST BORER (*Cyllene robiniae* Forst.)

The adult is one of the long-horned beetles about three-fourths of an inch long, black in color, with bright yellow bands extending across the body. The insect is very destructive to our common locust, *Robinia pseudoacacia*, and also to the rose acacia, *Robinia hispida*. The beetles appear in September, when they may be found feeding on the blossoms of goldenrod. Eggs are

laid about that time in clusters or singly, on the roughened bark of trunks and branches. The young larvae hatching from them tunnel into the bark, where they spend the winter. In spring they resume feeding and go into the heart-wood. An enlargement forms at the entrance of the burrow, and in time the trunks of young trees become much deformed; on older trees the branches are injured.

Successful and practical measures for the control of this insect have never been found. If only a few trees are involved, the larvae may be dug from their burrows. Repellent washes applied to the trunks of trees during the egg-laying period have proven expensive and only moderately effective.

(Ohio Bulletin 332, page 316).

#### POPLAR AND WILLOW BORER (*Cryptorhynchus lapathi* Linn.)

This insect is one of the snout beetles or weevils and is about one-third of an inch long, dark gray in color, except the tips of the wing-covers, which are paler. (See Fig. 27). Injury is



FIG. 27. Poplar and willow borer, twice enlarged.

caused by both adults and larvae. The adult punctures the bark of the trees and the grubs bore into the trunk and branches. The injury, shown on Plate X, a, is greatest to nursery stock and newly set trees; after the trees are older and well established, less injury occurs.

The winter is passed in the larval stage within the host plant. The adults appear late in July and are most abundant in August. Mating and egg-laying take place about ten days after emergence.

Infestation is indicated by dead patches of bark, dead or dying trees or limbs with irregular swellings or galls formed over tunnels.

One remedy is to cut out and burn all infested wood before May or June, to prevent the grubs from reaching maturity. Probably the insect can be controlled by thoroughly coating the bark in July with arsenate of lead. Painting the trunks of trees early in April with Carbolineum or some other repellent has also been recommended.

(Ohio Bulletin 332, page 319).

## SUCKING INSECTS

## MITES

Though "mites" or "red spider" are not insects, there are several species which injure the leaves of trees, causing them to turn dull and brown the latter part of the season. Mites belong to the Order Acarina (Class Arachnida) and usually have four pairs of legs, thus differing from insects (Class Insecta) which usually have three pairs of legs in the adult stage.

In mite infestations pale, brownish spots are noticed on the leaves, which may later cover the entire foliage. When these spots are examined with a magnifying glass, tiny globular eggs, eggshells, mites, and their cast skins may be seen.

One of the common mites in nurseries, especially on oak and maple, is *Paratetranychus bicolor* Banks. The European red mite, *Paratetranychus pilosus* C. & F. (see page 140), which is an important pest of fruit trees, also occurs on elm and probably on other kinds of shade trees. The common "red spider" of greenhouses, *Tetranychus bimaculatus* Harvey (*telarius* Linn.) may injure the foliage of almost any tree species. With *T. bimaculatus*, evidently the adults hibernate, but with *P. bicolor* and *P. pilosus*, reddish or brownish eggs are laid in the fall on the bark of the trunk and branches. On hatching in spring, the young mites find their way to the leaves.

The remedies are: a dormant spray of a miscible oil (1 - 15) to kill the overwintering eggs; a summer spray of linseed oil emulsion to kill the mites. This emulsion may be made as follows:

- 1 gallon raw linseed oil
- 1.5 pounds soap flakes
- 1 gallon water

Dissolve the flakes in the water, stir in the linseed oil, and dilute to make 100 gallons.

(Bulletin 252).

## GREEN APHIDS

There are many species of green aphids attacking deciduous trees during the growing season. In fact, nearly every tree species has one or more species of aphids infesting its leaves. The aphids may occur in the winged or wingless forms. They suck the sap through their long pointed beaks and excrete a sticky substance called "honey dew," which drips upon the foliage, giving the leaves a varnished appearance. In the honey dew a black fungus or sooty mold grows, giving the leaves a blackened appearance. Ants feed upon the honey dew and are usually present on

aphid-infested trees, but the ants do no harm to the trees. The presence of aphids may be noticed also in some cases by the curled leaves or the abnormal dropping of the leaves.

Aphids may be killed by spraying with a contact spray like nicotine solution and soap, but they must be hit by it. As they are mostly on the under leaf surface, the spray should be directed there. Applications should also be made before the aphids are destructively abundant and before the leaves are curled or seriously injured.

#### BEECH WOOLLY APHID (*Phyllaphis fagi* Linn.)

Trees of the European beech, *Fagus sylvatica*, especially the purple-leaved form, are usually infested in Connecticut by a white woolly aphid which appears on the under side of the leaves in early summer. The woolly appearance is due to slender wax filaments secreted by the aphids.

They may be controlled like other aphids with a spray of nicotine solution and soap.

#### WILLOW APHIDS

Large reddish brown aphids are often present in large numbers on the twigs of willows, where they lay eggs late in the season. These belong to the genus *Chaitophorus*, two species—*viminalis* Monell and *nigrae* Oest.—occurring in Connecticut. There is also an even larger species, *Longistigma caryae* Harris, which occurs on oak, hickory, maple, elm, poplar, linden, and sycamore. The remedy is that given above.

#### OAK GALL SCALE (*Kermes* sps.)

Hard, globular scales occur on oak trees in nurseries and are usually gray or brown in color. There are several species, some smooth and shiny, some dull, and some pubescent. The partially grown females winter in the crevices of the bark, and some species in the spring go to the leaves. The young appear in July or August. The bodies of the females often remain on the twigs for nearly a year after they die. Shown on Plate XV, e.

Spraying the dormant trees in early spring with a miscible oil (1-15) is effective.

#### PIT-MAKING OAK SCALE (*Asterolecanium variolosum* Ratz.)

This scale infests several species of oak but is most frequently encountered on English or golden oak, *Quercus robur*. It has a



smooth, glassy, convex shell about one-sixteenth of an inch in diameter and is of a beautiful greenish-golden color. A little pit is formed around each insect, from whence its common name arises. It is also called the golden oak scale. It is believed to be single-brooded, but this point has not been determined for Connecticut. The insect passes the winter in the egg-stage under the old shells, and the young appear in May and June. The insect is shown on Plate XI, c.

A dormant spray of a miscible oil (1 - 15) is probably the best means of control.

(Ohio Bulletin 332, page 306).

#### TULIP TREE SCALE (*Toumeyella liriodendri* Gmel.)

This is our largest soft scale, the females being brown, hemispherical, and nearly one-third of an inch in diameter, shown in



FIG. 28. Tulip tree scale.

Fig. 28, and on Plate XI, d. The males are oval, gray, and flattened, and about an eighth of an inch in length. The scales usually occur on the lower branches of the tulip tree, and there is a single generation each year, the young appearing in September. The remedy is to spray as soon as the leaves fall, using a miscible oil or a nicotine solution.

(Report for 1921, page 176).

#### TERRAPIN SCALE (*Lecanium nigrofasciatum* Pergande)

This is a small, oval, and very convex soft scale, reddish-brown in color, which infests the small twigs of maple trees (see Plate XI, b), especially the red and silver maples. On large trees it is more apt to be on the lower branches, and though not particularly a nursery pest, it is occasionally found on the nursery trees of larger size. The eggs are formed under the old shells in June and hatch late in June or early in July. Only the females live through

the winter, and they are in a partially grown state. The scales suck the sap from the twigs in fall and spring, becoming mature about June 1.

The remedies are contact insecticides, especially miscible oils (1 - 15), applied when the trees are dormant.

(Report for 1921, page 183).

EUROPEAN FRUIT LECANIUM. See page 123

EUROPEAN ELM SCALE (*Gossyparia spuria* Mod.)

This is a chocolate-brown scale, oval in shape, with a fringe of white wax around the margin, shown on Plate XI, a. It usually occurs in the crevices of the bark of trunk and larger branches. There is one generation each year, the insect hibernating on the bark in a partially grown state. The young appear in June. The standard contact sprays will kill this scale at almost any time of the year, though more thorough applications can be made when the trees are dormant.

(Report for 1905, page 235).

COTTONY MAPLE SCALE (*Pulvinaria vitis* Linn.)

This insect is perhaps the most conspicuous of all the scale insects on account of the abundant secretion of wax surrounding the eggs. During the winter it occurs on the bark and resembles any other large, brown, soft scale, but about the time the trees begin to grow, the posterior end of the insect becomes raised, and the egg-sac begins to protrude, as shown on Plate XI, e. When fully developed it is as long as the insect itself and resembles a tuft of cotton. Each female deposits about three thousand eggs, which hatch in late June or early July. The young at first go to the leaves and establish themselves mostly on the under side along the midrib and veins. Before the foliage drops, they return to the twigs and settle on the bark for the winter.

In Connecticut this insect has occurred abundantly only in the vicinity of Stamford and attacks silver and red maples, though all other kinds are also infested in some portions of the Middle West, where there are periodical outbreaks every eight or ten years. It occurs in Connecticut nurseries on a variety of trees, shrubs, and vines, but is seldom sufficiently abundant to cause injury. It is perhaps the most common on maple.

The remedy is to spray the dormant trees in early spring, using one of the miscible oils (1 - 15).

(Report for 1921, page 179).

ELM SCURFY SCALE (*Chionaspis americana* Johnson)

This scale, which occurs on the twigs and branches of elm, is dirty-white or gray in color and somewhat resembles the cyster-shell scale. It passes the winter in the form of purplish eggs under the old shells, and there are two generations each season. Small branches are killed in severe infestations, and the general vitality of the tree is lowered.

Spraying the dormant trees with liquid lime-sulphur (1-8) or with one of the miscible oils (1-15) will control this insect.

(Ohio Bulletin 332, page 290).

OYSTER-SHELL SCALE. See page 123

## INSECTS INJURING SHRUBS AND VINES

## KEY

## A. Feeding upon the leaves:

1. Conspicuous caterpillars, bearing horns or spines ..... 2  
Conspicuous caterpillars, without distinct horns or spines..... 4
2. Caterpillars with horns or fleshy protuberances..... 3  
Caterpillars 2-3 inches long, covered with branched stinging spines,  
pale green with reddish band along each side,  
    To Caterpillar, p. 155  
Caterpillars one inch long or less, each end with a pair of promi-  
nent tubercles bearing stinging spines; color brown with green  
saddle.....Saddle-back Caterpillar, p. 155
3. Green caterpillars with single horn on tail, on grape or Virginia  
creeper.....Sphinx Caterpillars or Horn Worms, p. 156  
Brown caterpillars with fleshy protuberances on each side of tho-  
racic segments, on Dutchman's pipe vine,  
    Pipe-Vine Caterpillar, p. 156
4. Large fleshy caterpillars, 3-4 inches long, bluish-green, with promi-  
nent tubercles, usually feeding on rosaceous plants,  
    Cecropia Caterpillar, p. 156  
Smaller (1-2 inches), finely cross-striped with black, white and  
orange, feeding upon Virginia creeper,  
    Eight-spotted Forester, p. 157
5. Small, green, slug-like caterpillars on rose....Rose Sawflies, p. 157  
Larger, gray, slug-like caterpillars on *Lonicera*,  
    Honeysuckle Sawflies, p. 158

## B. Borers in stems:

6. White grub, about one inch long, tunneling in lilac or privet.  
    Lilac Borer, p. 158  
Very small, flat-headed white grub, forming swellings on rose  
stems.....Rose Stem Girdler, p. 158

## C. Forming galls on leaves:

7. Shiny, semi-transparent galls on leaves and tendrils of grape,  
    Grape-vine Tomato Gall, p. 158  
Small pocket galls on leaves.....Eriophyid Mites, p. 159

## D. Sucking sap from leaves or bark:

8. Scale insects protected by shells, mostly on bark..... 9  
Green plant lice on leaves.....Aphids, p. 150
9. Female scale, circular or nearly so ..... 10  
Female scale, pear-shaped, dark gray, on *Euonymus*,  
*Euonymus* Scale, p. 159
10. Female scales, 2-3 mm., snow-white, exuviae marginal, light yellow, eggs purple, on rose and blackberry.....Rose Scale, p. 159  
Same size, scale whitish but more or less covered with bark of host, exuviae marginal, orange-yellow; on cherry, privet, and *Catalpa bungei*.....White Peach Scale, p. 159  
Female scales less than 2 mm., dark gray, exuviae central, yellow,  
San José Scale, p. 137

IO CATERPILLAR (*Automeris io* Fabr.)

This caterpillar is from two to three inches long when fully grown, pale green, with a reddish and white stripe along each side, each segment bearing a number of tubercles arranged crosswise in a row, as shown on Plate XII, c. Each tubercle has a number of spreading, stinging spines which cause an intense itching or rash on coming in contact with the human skin. Apparently there is only one generation each year, and the insect passes the winter in its cocoon among the leaves on the ground. The moths emerge in June and July. The female has a wing-spread of about three inches, and the male about two and one-half inches. The ground color is yellow with reddish markings, and in the female the entire fore wings are tawny. On each rear wing in both sexes there is a bluish eye spot margined with black, and with a white dash in the center; between the spot and the wing-margin are two concentric rings, one red and the other black.

The caterpillar feeds upon many kinds of shrubs and trees. Spraying with lead arsenate is the remedy.

(Ohio Bulletin 332, page 270).

SADDLE-BACK CATERPILLAR (*Sibine stimulea* S. & A.)

The caterpillars of this species are often gregarious and feed upon a large number of plants. They are nearly an inch long, without true legs, and are brown and green in color. Both ends of the body and the long tubercles are brown, but the middle of the body looks as though covered by a bright green blanket with an oval opening on the back, as shown on Plate XII, a. This gives it the common name "saddle-back." On the prominent brown tubercles, and laterally on the smaller green ones, there are branched, stinging spines which to the touch are quite painful for an hour or two. The reddish-brown moth has a wing-spread of about one and one-half inches. There is one generation annually.

Spraying with lead arsenate will prevent defoliation.

(Report for 1914, page 188).

## SPHINX CATERPILLARS OR HORN WORMS

Grape vines, Virginia creeper, and Boston ivy are often eaten by caterpillars of this group. Most of them may be distinguished by the sharp horn on the back near the tail, as shown in Fig. 29, and several species belonging to different genera may be encountered. All belong to the family Sphingidae.

The abbot sphinx, *Sphecodina abbotti* Swains., has in place of the horn a shiny spot or tubercle. This caterpillar is brown, veined

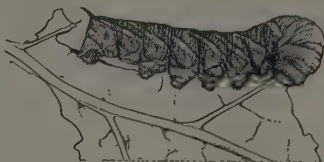


FIG. 29. A sphinx caterpillar or horn worm.

with a darker brown, but a form occurs having a large green patch on the dorsal portion of each segment.

All sphinx moths have large bodies and long narrow wings. They fly at dusk, poise with vibrating wings before deep-throated flowers, and for this reason are called "humming-bird moths."

Hand picking is the usual remedy, but if the caterpillars are injuriously abundant in nursery or vineyard, spraying with lead arsenate will prevent defoliation of the vines.

PIPE-VINE CATERPILLAR (*Papilio philenor* Linn.)

Wherever the Dutchman's pipe, *Aristolochia sipho*, is grown, the leaves may be eaten by the pipe-vine caterpillar. This caterpillar is velvety dark brown or black, marked with orange spots and bearing a number of long black and orange protuberances, and is shown with cocoon on Plate XII, d. When fully grown it is two inches or more in length. The adult is a swallow-tail butterfly having a wing-spread of 3-3.5 inches, velvety black with metallic bluish or greenish reflections. There are two generations each year.

Spraying the vines with lead arsenate is probably the best remedy.

(Holland's Butterfly Book, page 315).

CECROPIA CATERPILLAR (*Samia cecropia* Linn.)

This is one of the largest caterpillars commonly found feeding upon nursery stock and is from 3-4 inches long when full grown



and about three-fourths of an inch thick. It has a peculiar bluish-green color with a cross row of tubercles on each segment; those on the second, third and fourth segments are red, the other dorsal ones yellow, with pale blue tubercles along the sides near the breathing pores. (Shown on Plate XII, e). The cocoon is brown and fastened lengthwise to a twig. The moth has a wing-spread of 4-6 inches, is gray and prettily marked with black, red, and creamy-white, with a lunule on each wing. There is only one generation each year, and it passes the winter in the cocoon.

The caterpillar feeds upon spiraea and other plants of the rose family, but is also found upon box-elder and willow.

Hand-picking is perhaps the only remedy needed in Connecticut, but where abundant, the caterpillars may be controlled by spraying with lead arsenate.

(Ohio Bulletin 332, page 266).

#### EIGHT-SPOTTED FORESTER (*Alypia octomaculata* Fabr.)

The caterpillars of this insect occasionally defoliate Virginia creeper and also feed upon grape, barberry, and rose. They feed in July, and are between one and two inches in length. Their general color is brown with a bluish tinge. Each segment is narrowly banded crosswise with black and white, with a broader band of orange dotted with small black dots. Head and cervical shield are orange with black dots. The moth is black with two round yellow spots on each fore wing and two smaller white spots on each rear wing. The insect passes the winter in the chrysalid stage in the soil, and there is only one annual generation. Caterpillars and moths are shown on Plate XII, b.

Hand-picking and spraying with lead arsenate are the remedies. (Report for 1916, page 118).

#### ROSE SAWFLIES (*Caliroa aethiops* Fabr. and others)

Small, greenish slugs often feed upon rose leaves, skeletonizing them. Several species may be involved, one of the most common being named above. This has only one annual generation, but some of the other species probably have more. The adults are four-winged flies, and on account of the toothed ovipositor in the female they are called sawflies.

The larvae or slugs are easily killed by spraying with lead arsenate, with nicotine solution and soap, or fresh hellebore applied as a spray or dust.

(U. S. Farmers' Bulletin 1252).

HONEYSUCKLE SAWFLIES (*Abia americana* Cress., and  
*A. inflata* Nort.)

The leaves of various species of bush and climbing honeysuckles are sometimes eaten by the larvae of at least the two species of sawflies named above. In one case the climbing honeysuckle on a wire fence was defoliated. The larvae were grayish-green with orange spots, and presumably there is only one generation each year.

Defoliation may be prevented by spraying with lead arsenate.

LILAC BORER (*Podosesia syringae* Harris)

Lilac and privet are often injured by white grubs burrowing in the stems. Sometimes the stems break over, and in other cases they remain standing and present an unthrifty appearance. The adult is a wasp-like, clear-wing moth of the family Sesiidae, and there is one generation each year. (See Plate XIII, a).

The best means of control is to cut out and burn the infested stems.

(Report for 1905, page 260).

ROSE STEM GIRDLER (*Agrilus viridus* var. *fagi* Ratz.)

Recently an European insect has appeared in Connecticut, called the rose stem girdler, which causes the formation of swellings on the stems of various species and varieties of rose, as shown on Plate XIII, b. *Rosa rugosa* and *R. hugonis* have been noticed with these swellings, which are the result of the plant making an attempt to heal the wounds around the galleries of the larvae.

The adult is a metallic, coppery beetle, about one-third of an inch long, which lays eggs singly on the bark in June and July. The larva is a slender white, flat-headed grub.

The only known remedy is to cut and burn the infested stems in winter or early spring before the beetles emerge.

(Report for 1925, page 325).

GRAPE-VINE TOMATO GALL (*Lasioptera vitis* O.S.)

The leaves, peduncles, tendrils, and tender shoots of grape vines are often marked and seriously distorted by irregular water thickenings or swellings which are sometimes red and sometimes green, as shown on Plate XV, b. The adult is a two-winged fly which places its eggs on or in the succulent tissues. The larvae develop in cells in the center of the galls.

The only known method of control is to clip off and burn the infested tips.

(Report for 1916, page 146).

## ERIOPHYID MITES (Family Eriophyidae)

The leaves of shrubs and young trees often exhibit minute galls, usually on the upper surface, caused by mites of the family Eriophyidae. A common form makes elongated pocket galls on the pearl bush, *Exochorda grandiflora*. Other forms are found on elder, birch, maple, and elm. These mites do not seriously affect the vitality of the host but render its appearance unsightly. (Shown on Plate XV, d).

Probably the best control is a dormant spray of liquid lime-sulphur in early spring just before the leaves appear.

## APHIDS (Family Aphididae). See page 150

EUONYMUS SCALE (*Chionaspis euonymi* Comst.)

Some kinds of Euonymus, as well as bitter-sweet, are infested and seriously injured, even sometimes killed, by this scale. The females are pear-shaped, dark gray, and occur on leaves or tender shoots. The males are smaller, elongate, with parallel margins, and are snowy white. There are said to be two broods each year, the insect passing the winter as eggs under the shells of the mother scale. This scale is shown on Plate XV, a.

The remedies are to prune off and burn the worst-infested stems. The remaining portions may then be sprayed in early April with a miscible oil (1 - 15), or in summer with kerosene emulsion containing 15 per cent or more of kerosene.

(Report for 1921, page 185).

ROSE SCALE (*Aulacaspis rosae* Bouché)

Rose, blackberry, and some other plants are often infested by a whitish scale, nearly circular, and a little less than one-eighth of an inch in diameter. These are the female scales which, during the winter, cover purple eggs. The male is long and narrow, with three ridges lengthwise, and is also white. This scale is shown on Plate XIV, a.

Cutting and burning the worst-infested stems is recommended; then spray while the plants are dormant, using either liquid lime-sulphur (1 - 9) or a miscible oil (1 - 15).

(Ohio Bulletin 332, page 295).

WHITE PEACH SCALE (*Aulacaspis pentagona* Targ.-Tozz.)

This has also been called the West Indian peach scale, and though closely related to the rose scale, is much less conspicuous on account of the bark, dirt, and extraneous matter on the shells.

In Connecticut it has been found on cherry, privet, and *Catalpa Bungei*, but is not believed to be an important or serious pest. It is shown on Plate XIV, b.

Spraying with a miscible oil or with lime-sulphur when the plants are dormant is believed to be an effective means of control.

(Report for 1913, page 240).

SAN JOSÉ SCALE. See page 137

## INSECT PESTS OF EVERGREEN TREES AND SHRUBS

### KEY

#### A. Chewing insects devouring leaves and buds:

1. Larvae devouring the leaves..... 2  
Larvae mining within the leaves..... 3
2. Larvae an inch or more in length, white, buff, or green, dotted, striped or mottled with brown or black, feeding gregariously, without webs, on pines..... Pine Sawflies, p. 161  
Larvae one-half inch long, striped lengthwise with light and dark brown, webbing together the twigs of juniper, Juniper Webworm, p. 161
3. Minute larvae mining within the leaves of arborvitae, Arborvitae Leaf-Miner, p. 161  
Maggots mining within the leaves of box, Boxwood Leaf-Miner, p. 162
4. Destroying the terminal buds of pine, causing crooked growth. European Pine Shoot Moth, p. 162  
Destroying the terminal buds of spruce.... Spruce Budworm, p. 162

#### B. Attacking roots or stems:

5. Gnawing the bark of the stems of coniferous seedlings. Pales Weevil, p. 163  
Gnawing the bark of the roots of hemlock and *Taxus*, Otiorhynchid Weevils, p. 163  
Eating off the roots of seedlings..... White Grubs, p. 164
6. Boring in the leaders of white pine, causing them to wilt in July. White Pine Weevil, p. 164  
Boring in the stems of rhododendron, Rhododendron Borer, p. 165

#### C. Sucking juices from leaves or bark:

7. Woolly aphids: wax secretion prominent ..... 8  
Wax secretion slight, forming cone-shaped galls on spruce. Spruce Gall Aphids, p. 165
8. Cotton-like tufts of wax in axils of leaves and white patches on bark of white pine..... Pine Bark Aphid, p. 166  
Cottony wax secretion on leaves of larch. Larch Woolly Aphid, p. 166  
Cottony wax secretion on leaves of Douglas fir. Douglas-Fir Woolly Aphid, p. 166
9. Elongated white scales on pine leaves..... Pine Leaf Scale, p. 166  
Circular scales on leaves of juniper..... Juniper Scale, p. 167
10. Lace-like insects on under side of leaves of rhododendron and *Kalmia*..... Rhododendron Lace Bug, p. 167  
Red spiders on leaves..... Spruce Mite, p. 167

## PINE SAWFLIES (Family Tenthredinidae)

Different kinds of pine trees are sometimes defoliated by sawfly larvae which usually feed gregariously and are whitish, greenish, or buff, variously dotted or otherwise marked with black or brown. They have the habit of coiling the tail around a leaf as a means of holding on to the food plant. One of the commonest species in nurseries is the imported pine sawfly, *Diprion simile* Hartig. The larvae are slightly more than an inch long, greenish yellow, more or less striped dorsally with brown, and the sides curiously spotted and reticulated, as shown on Plate XIV, c. This species feeds upon the white, Bhotan, Scotch, Austrian, Korean, Mugho, and several other kinds of pines, and there are two full generations each season. Some of the brown cocoons are fastened to the twigs and some are placed upon the ground under the trees. Other species feeding on pine in Connecticut are: *Neodiprion lecontei* Fitch, on white, jack, red, Scotch, Austrian, and Mugho pines; *N. pinetum* Norton, on white pine, and *N. pinus-rigidae* Norton, on pitch pine.

The remedy is to spray with lead arsenate.

(Report for 1915, page 118).

JUNIPER WEBWORM (*Dichomeris marginellus* Fabr.)

Juniper twigs are webbed together by the larvae of this insect, which feeds upon the leaves inside the nest. (See Plate XIV, d). Low juniper in ornamental plantings is often defoliated, but apparently *Juniperus hibernica* is greatly preferred. The caterpillars are about half an inch long, light brown, with longitudinal stripes of darker brown. The adult is a moth with a wing-spread of 15 mm., dark brown, with white front and rear margins on the fore-wings. The larvae pupate in the webs, and the moths appear early in June, but the life history has not been carefully worked out, and it is possible that there is more than one generation each year.

Spraying heavily with lead arsenate is a satisfactory remedy.

(Report for 1915, page 137).

ARBORVITAE LEAF-MINER (*Argyresthia thuella* Pack.)

Small larvae mining in the leaves often give a brown or dead appearance to arborvitae. (See Plate XVI, b). The adult is a tiny moth which lays eggs on the leaves in June. There is one annual generation, and the insect spends the winter in the cocoon in the mine.

Though remedial measures are of somewhat questionable value, it is thought that a heavy application of nicotine solution and soap or of fish-oil emulsion may kill some of the eggs or larvae and thus prevent severe injury to the foliage by the insects.

(Report for 1921, page 157).



BOXWOOD LEAF MINER (*Monarthropalpus buxi* Labou)

The adult of this insect is a yellow midge or two-winged fly which lays eggs in the leaves in May, and the maggots feed and develop between the upper and lower epidermal layers, causing a blistering and distortion of the leaves, often called galls. (Shown on Plate XVI, a). The foliage is usually thin on infested plants. The maggots live over winter in the leaves and pupate in spring.

The remedy is to spray the plants with a cheap molasses, one part in four parts of water, with the addition of nicotine sulphate, one part in 500 parts of the spray material. The first application should be made when the adults first begin to emerge from the infested leaves, and the plants should be kept covered for three weeks. One application each week will answer in fair weather, but the plants should be sprayed after each rain.

(Report for 1923, page 312; Maryland Bulletin 272).

EUROPEAN PINE SHOOT MOTH (*Rhyacionia (Evetria) buoliana* Schiff.)

This is a serious pest of all kinds of pines in Europe and is now present in Fairfield County, Connecticut, where it seems to prefer the red pine. The adult is a small orange moth which in August lays eggs singly on the newly formed terminal buds which are ready for next year's growth. The young larvae soon eat their way into the buds and excavate cells in which they spend the winter. The following spring the larva leaves its winter home and bores into the next bud, and thus destroys as many buds as may be needed for food. It also attacks the young shoots, feeding on one side, causing them to become curved and deformed. When mature, the larva pupates in an excavated shoot, and three weeks later the moth emerges. Apparently there is only one generation each year. Distorted and crooked growth called "bayonet shoots" follows the attack of this insect.

No remedy is known other than to prune and burn the infested buds and shoots.

(U. S. D. A. Bulletin 170).

SPRUCE BUDWORM (*Harmologa fumiferana* Clem.)

Spruce and balsam trees are often severely injured by this insect. The moths emerge in June and July and the females lay upon the needles their eggs, which hatch in ten days, but the larvae do little or no feeding until the following spring. They pass the winter in protective cases which they spin in crevices on the tree or other convenient shelters. The young caterpillars feed for about three weeks in the spring at the base of needles upon the terminal shoots, moving about freely. The severed needles are

loosely attached to the twigs by the silk threads spun by the larvae. When fully grown each larva is about three-fourths of an inch long, and it then pupates upon the tree. The adult moth is gray with brown markings and white spots. There is only one annual generation.

Spraying heavily with lead arsenate will doubtless prove effective in the nursery and on small ornamental trees.

(Manual of Tree and Shrub Insects, page 285).

#### PALES WEEVIL (*Hylobius pales* Herbst)

This insect is a Curculionid or snout beetle less than half an inch in length. In color it varies from dark reddish-brown to black, and usually has gray or whitish hairs so arranged as to form small spots on the wing-covers. This beetle is believed to be responsible for the failure of much of the forest planting where conifers are used and has also injured seedlings in nurseries by eating off the bark of the stems, thus in effect girdling the young trees. Nearly all kinds of coniferous trees are attacked, and the feeding is done at night. There is only one generation each year, and the beetles hibernate in the soil at the base of the trees. The eggs are laid and the larvae feed in pine stumps and logs.

As a control measure, seedlings or nursery stock should not be grown in close proximity to pine logs, stumps, or lumber.

(Harvard Forest Bulletin 3).

#### OTIORHYNCHID WEEVILS (*Otiorhynchus sulcatus* Fabr. and *O. ovatus* Linn.)

*Taxus* plants are occasionally injured in nurseries by the grubs or larvae of *Otiorhynchus sulcatus* Fabr., a black snout beetle with faint gray spots, half an inch in length, commonly called the black vine weevil, and shown on Plate XVIII, b.

A case of injury occurred in a nursery in 1913: The smaller roots had been devoured, and the larger ones and the main stem had been girdled. In 1909, hemlock trees from 12 to 18 inches tall showed signs of unthriftiness, failed to grow, and some of them dropped their leaves. At the roots were grubs, pupae, and adults of *Otiorhynchus ovatus*, commonly known as the strawberry crown girdler. This species is about one-fourth of an inch long and is brown without color markings. This smaller species had girdled the main stem and larger roots.

Treating the soil with an emulsion of carbon disulphide, as is done to kill the grubs of the Japanese beetle and the Asiatic beetle, may be recommended in severe infestations.

(Report for 1909, page 370; 1913, page 230).

WHITE GRUBS (*Phyllophaga* or *Lachnosterna* sps.)

The larvae of May or June beetles occasionally eat off the roots of coniferous trees in nurseries. There are probably several species involved, and most of them require three years to complete the life cycle. The injury is usually the most severe the third season, when the grubs are large and voracious. Shown in Figs. 30 and 31.

In some cases it may be possible to treat the soil about the plants with an emulsion of carbon disulphide.

(Report for 1912, page 288).



FIG. 30. White grub and its adult, the common June beetle.



FIG. 31. Pine seedling with roots eaten off by white grubs.

WHITE PINE WEEVIL (*Pissodes strobi* Peck)

The white pine weevil probably causes more injury to white pine trees in Connecticut than any other insect, and perhaps more than all other insects together. It also injures spruce trees. There is one annual generation, and the beetles hibernate somewhere during the winter and appear on the pine trees about May 1. They make punctures in the bark of the leaders or terminal shoots of the preceding season's growth. In some of these punctures eggs are laid and soon hatch. The grubs feed in the cambium and sometimes in the pith, becoming mature in about six weeks, when they excavate cells in the wood in which they pupate. Late in July and continuing until September, the adult beetles emerge. The infested leaders wilt in July and later turn brown and die. In time a lateral branch will grow upright and take the place of

the leader, but this makes crooked and ill-shaped trees. The injury caused by this insect is shown in Fig. 32 and on Plate XVIII, c.

Trees may be partially protected by spraying the leaders about May 1 with either lead arsenate or liquid lime-sulphur (1-9).

(Report for 1919, page 144).



FIG. 32. Pupal cases, larval cells, and exit holes of the white pine weevil. About twice natural size.

#### RHODODENDRON BORER (*Sesia rhododendri* Beut.)

Serious injury to rhododendrons in ornamental plantings has been caused by the rhododendron borer in Connecticut, though the work of the insect has not been very noticeable in nurseries. The adult is a wasp-like clear-wing moth which lays eggs in late May or June on the twigs. The larva soon after hatching tunnels into the sapwood of the stem, where it forms irregular galleries from one to two inches long, usually just below a crotch. Larvae are yellowish-white, about half an inch long, and usually become full grown by October but remain in their galleries through the winter and pupate there in the spring. Two weeks later the moths appear, and there is only one annual generation.

The injured stems cannot supply the necessary moisture and the leaves turn brown and die. The stems are often broken at the point of injury. *Rhododendron maximum* is perhaps more severely injured than other species, but hybrid rhododendrons are also attacked. The injury is shown on Plate XVII, a.

There is no remedy except to cut out the borers and to prune off and burn infested stems and branches.

(Report for 1922, page 347).

#### SPRUCE GALL APHIDS (*Adelges*, *Chermes*, sps.)

One of the commonest pests in nurseries is the spruce gall aphid, *Adelges abietis* Linn., which forms cone-shaped galls at the base of the new growth on Norway spruce, and sometimes black, red, and white spruce trees are infested to a less extent. There are two broods each season, the winter being passed by the immature females on the twigs. They reach maturity and lay on the leaves masses of eggs which hatch soon after the new shoots appear in May. The young aphids crawl to the base of the shoots and at-

and themselves where the irritation resulting from their feeding causes the needles to swell at the base until they wither and fall. These galls are formed in which the young aphids are enclosed, and the result is one continuous gall shaped like the cone of the tree. These galls break open in August and the aphids go to the leaves and soon transform to mature females which lay eggs for the second brood. One of the galls is shown in Plate II, III, a.

Larger terminal galls on the Colorado blue spruce are formed by *Adelges abies* Coll. (see Plate II, III, b), and a form known as variety *pyramis* Coll. is the widely spread common upon the leaves of Douglas fir. Another species *Abies* (Thomas) *pyramis* is known as the larva widely spread, and is common on larch foliage in midsummer.

The remedy is to spray the trees early in April with a mixture of 1-25 to kill the overwintering females. The summer forms on leaves may be killed by spraying with nicotine solution and soap.

(Report for 1919, page 207.)

#### PINE NEED ARMS (*Adelges* (Thomas) *pinus* Fitch)

Small worm-like tubes of wax in the axils of the leaf needles are common on small white pine trees and on larger ones large numbers of the tubes are often seen. The pine needle aphid is the cause, but its life history is not fully known. Eggs hatch about May 1 and the young crawl along the wings and near the tip down the back soon becoming covered with slender filaments of wax giving them the appearance of small tubes of wax. It is shown in Plate II, III, a.

Trees can be securely treated at this season by a thorough spraying in June with nicotine solution and possibly nicotine solution and soap will prove equally effective.

(Report for 1919, page 207.)

#### PINE LEAF GALLS (*Adelges* (Thomas) *pinus* Fitch)

These small pine trees show a rounded white gall at the base. This is the pine leaf gall which induces Douglas spruce, and red spruce and white pine sometimes killing them. There are two generations each year but the eggs hatch in the winter and carry the species through the winter. These eggs hatch in March in May, but the hatching period is a long one, and the two broods are not always well marked.

Illustrations of this gall are shown in Plate II, III, a.

Control measures for this insect have not been tried, but it is known that in Connecticut it is not dangerous as it is in other parts of the

mant spray applications of liquid lime-sulphur (1 - 9), or of miscible oil (1 - 15) in April, and of nicotine solution and soap between June 1 and August 1.

(Report for 1921, page 181).

#### JUNIPER SCALE (*Diaspis carueli* Targ.-Tozz.)

Small, circular, whitish scales 1-2 mm. in diameter are often present and sometimes very abundant on the leaves of juniper, resulting in a yellow and sickly appearance.

Spraying with a miscible oil (1 - 25) in spring, before the new growth starts, will probably control this insect.

(Report for 1920, page 212).

#### RHODODENDRON LACE BUG (*Leptobyrssa rhododendri* Horvath)

This is a sucking bug belonging to the family Tingidae and commonly called lace bug. It is on the under side of the leaves of rhododendron, especially *R. maxima*, and *Kalmia latifolia* or mountain laurel. Apparently there is only one brood each year. The eggs are laid along the midrib, and there is much brownish discoloration from the excrement. The injured leaves show whitish spots on the upper surface. (See Plate XX, d).

Spraying the under sides of the leaves with nicotine solution and soap when the bugs are present has been effective.

(Report for 1921, page 200).

#### SPRUCE MITE (*Paratetranychus ununguis* Jacobi)

Spruce trees and other evergreens are often severely injured by mites. Such injury is noticed somewhere in the State each year, though it is usually more severe and more widespread in seasons of drought. The leaves are peppered with small whitish spots, covered with brownish eggs and egg-shells, and are usually more or less webbed together. The greenish-yellow living mites and their cast skins are also abundant.

Spraying in spring before the new growth starts with a miscible oil (1 - 15) to kill the eggs, and the application of liquid lime-sulphur (1 - 50) or linseed oil emulsion to kill the mites in midsummer, are recommended. Some of the oil preparations are apt to remove the bloom from some of the varieties of blue spruce.

(Report for 1922, page 340).



## INSECTS INJURING PERENNIAL PLANTS

## KEY

## A. Chewing Insects:

1. Attacking the leaves..... 2  
Attacking the stem or root..... 5
2. Devouring the leaves ..... 3  
Mining within the leaves of columbine,  
Columbine Leaf-Miner, p. 168
3. Perforating or devouring portions of the entire thickness of the  
leaves ..... 4  
Minute jumping insects feeding on surface of leaves of seedlings,  
Garden Spring-Tail, p. 169
4. Feeding at night, hiding during the day:  
Larvae with true legs, curled up in soil around base of plant,  
Climbing Cutworms, p. 130  
Gray or brown slugs without legs, hiding under rubbish and leav-  
ing a slimy trail.....Garden Slugs, p. 170
5. Cutting off the stem near the surface of the ground:  
Larvae curled up in soil near the plant.....Cutworms, p. 169  
Striped larva boring lengthwise in stem.....Stalk Borer, p. 170  
Pink larva burrowing in rootstocks of iris..Iris Root Borer, p. 171

## B. Sucking Insects:

6. Visible insects attacking leaves or shoots at tip..... 7  
Reddish mites with eggs and shells injuring leaf surface,  
Red Spider, p. 150  
Microscopic, glassy mites, curling leaves of larkspur and some  
other plants .....Cyclamen Mite, p. 172
7. Exceedingly active flying bugs, with nymphs on leaves..... 8  
Rather inactive plant-lice on leaves or stems .....Aphids, p. 150
8. Greenish-yellow bugs; adult with four black stripes, on terminal  
leaves .....Four-lined Plant Bug, p. 172  
Grayish or brownish bugs on terminal leaves,  
Tarnished Plant Bug, p. 139

COLUMBINE LEAF-MINER (*Phytomyza aquilegiae* Hardy)

In June, whitish serpentine mines begin to appear in the lower leaves of columbine. There are often several miners in a leaf, and the mines may continue to increase in size until the entire leaf is involved. Later the small leaves around the flower stalks are infested. There are several generations, the winter being passed as pupae in the ground. The eggs are laid in the under sides of the leaves and hatch in less than a week. The larvae mine between the upper and lower epidermal layers of the leaf, becoming mature in about two weeks, and emerge from the mines through crescent-shaped openings. They attach themselves to the leaf and pupate. In two weeks the adults emerge. They are small, dark brown flies about 2 mm. long. Injured leaves are shown on Plate XX, a.

Cultivating the ground around the plants in late fall or early spring will reduce the infestation. Removing and destroying the mined leaves when the infestation first appears will aid in the control of this pest.

(Report for 1894, page 145; New Jersey Department of Agriculture, Circular 36, page 13).

#### GARDEN SPRING-TAIL (*Sminthurus hortensis* Fitch)

Small seedling plants, particularly in hotbeds or cold frames, are often injured in early spring by minute, purplish, jumping insects which eat off the surface tissue from the leaves. These tiny insects are purple, spotted with yellow, and jump like fleas. Each has a globular-shaped body and rather large head with narrow neck. A forked tail-like appendage used in jumping extends rearward from the under side of the body, as shown in Fig. 33.

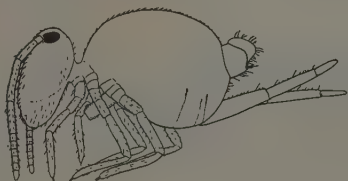


FIG. 33. Garden spring-tail.



FIG. 34. Cutworm and characteristic injury to plant.

This insect may be controlled by spraying or dusting the plants with nicotine.

(Bulletin 6, Tobacco Experiment Station, page 86 T).

#### CUTWORMS (Noctuidae, several species)

Perennial plants, especially the seedlings and tender shoots, are often cut off near the ground by cutworms, as shown in Fig. 34. There are also other kinds of cutworms which climb and feed upon the leaves. Most of the cutworms are single-brooded and live through the winter as partially grown larvae. The adult moths emerge and lay their eggs in late summer. All cutworms are the larvae of rather inconspicuous gray or brown moths of the family Noctuidae, and there are perhaps a dozen or more species that are classed as cutworms.

Injury from the climbing cutworms may be lessened by spraying the foliage with lead arsenate. The cutworms, which cut off the

stems of plants, can best be controlled with a poisoned bait distributed about the field a few days before the injury becomes serious. A formula for this bait is as follows:

|                                    |         |
|------------------------------------|---------|
| Wheat bran .....                   | 5 lbs.  |
| White arsenic or Paris Green ..... | 4 oz.   |
| Cheap molasses .....               | 1 pint  |
| Orange or lemon .....              | 1 fruit |
| Water .....                        | 7 pints |

Cut the fruit into small pieces and mix together to form a rather dry mash and scatter around the field.

### GARDEN SLUGS (Family Limacidae)

The leaves of garden plants are often eaten by slugs, which are closely related to snails but without the usual shell. One of the commonest species is the gray field slug, *Agriolimax agrestis* Linn., and another and more striking species is the giant or spotted garden slug, *Limax maximus* Linn., shown in Fig. 35.

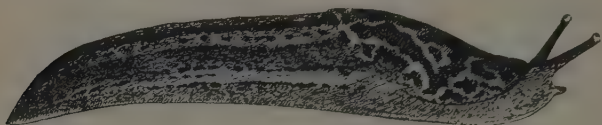


FIG. 35. Spotted garden slug, natural size. (After Kingsley, Riverside Natural History).

These animals feed at night on the tender leaves of garden and greenhouse plants, eating holes through the leaves or notches in the margins. They hide under rubbish during the day and leave a slimy trail wherever they crawl.

Plants may be protected by spraying or dusting with lead arsenate. As a rule, beds may be protected by surrounding them with a layer of air-slaked lime, but fine soot or coal ashes will answer the purpose, as the slugs do not like to crawl through such dry material.

(Report for 1918, page 333).

### STALK BORER (*Papaipema nebris* Guen.)

The stalk borer may be found in any kind of herbaceous stem and attacks vegetables, annual and perennial flowering plants, and weeds. (See Fig. 36). Among the perennials it is often found in hollyhock, lily, larkspur, peony, and chrysanthemum. There is a single generation each year, and the insect passes the winter as an egg on the stem of dead grass. The eggs hatch in May and the

larvae begin to tunnel in grass stems, later migrating to other plants. By August or early September, the larvae mature and pupate in the burrows; a month later the adults emerge. The moth has a wing-spread of about one and three-eighths inches and is brown, with conspicuous white discal spots on the fore wings. Larva and adult are shown on Plate XX, b and c.

Heretofore the only remedy has been to cut out the borer, burn the infested stalks, or inject carbon disulphide into the burrow and plug the opening. Burning the grass and weeds around the fields

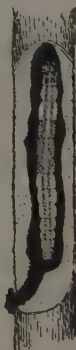


FIG. 36. Stalk borer.

in late fall or early spring is now known to have a tendency to reduce the number of stalk borers by killing the eggs.

(Report for 1919, page 180. New Hampshire Technical Bulletin 34).

#### IRIS ROOT BORER (*Macronoctua onusta* Grote)

The rootstocks of iris plants are injured by a pink larva tunneling in them, often devouring the entire rootstock and killing the plant. This is the larva of a brown moth with a wing-spread of about two inches, which probably has only one generation each year. The adults emerge in September or October and lay eggs upon the iris leaves. These eggs hatch in spring, and the young borers find their way into the rootstock, where they feed and increase in size, becoming fully grown in August. They then pupate in the ground, and later the adults emerge. Larva and moth are shown on Plate XIX, b and c.

Gathering and burning the leaves in late fall or early spring to destroy the eggs is the only remedy known.

(Report for 1918, page 331).

RED SPIDER (*Tetranychus bimaculatus* Harv.) See page 150

CYCLAMEN MITE (*Tarsonemus pallidus* Banks)

This mite often injures larkspur and several annual plants in the garden, as well as cyclamen, snapdragon, and chrysanthemum in the greenhouse. The new leaves become thickened and more or less curled, as shown on Plate XIX, a. Buds are also distorted and fail to open properly. The mites are almost too small to be seen by the naked eye, but under the magnifying glass they are white and glassy.

Frequent and thorough spraying with nicotine solution and soap, one part in 500 parts of water, if started when the injury first appears, will control this pest. This treatment should be repeated each week and, in severe cases, twice each week.

(Report for 1914, page 176).

APHIDS (Family Aphididae). See page 150



FIG. 37. Four-lined plant bug and injured currant leaf.

FOUR-LINED PLANT BUG (*Poecilopsus lineatus* Fabr.)

This greenish-yellow bug is about three-eighths of an inch long in the adult stage and has four black stripes on its back. In early spring when first hatched, it is bright red, with large black spots on the thorax. The eggs are laid by the adult bugs late in June or early July, but do not hatch until the following spring. The young nymphs feed for about three weeks and reach the adult or winged stage about the middle of June. There is but one generation each year. This insect has a wide range of food plants, being particularly injurious to dahlia, rose, currant, gooseberry, and mint.

It gets its nourishment by sucking the juices from the tenderest leaves near the ends of the shoots. The injured leaves turn brown in spots, which later become transparent, and in heavy infestations the entire leaf turns brown. (See Fig. 37).

The adults are shy and very active when alarmed and very difficult to capture. As they fly readily, they are not easily killed by sprays. The nymph, having no wings, may be killed by a spray of nicotine and soap, and some of the adults will likewise be hit and killed.

(Report for 1914, page 189).

TARNISHED PLANT BUG (*Lygus pratensis* Linn.) See page 139



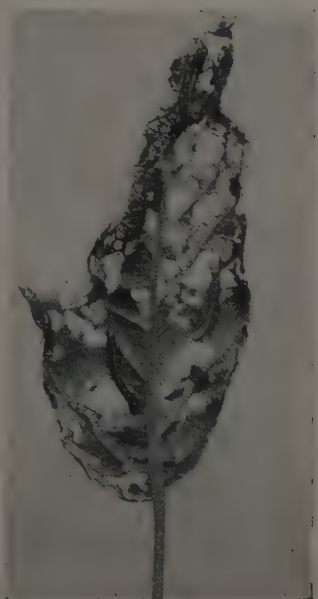




a. Adult female and egg-mass of fall cankerworm. Twice natural size.



b. Egg-mass of fall cankerworm on twig. Four times enlarged.



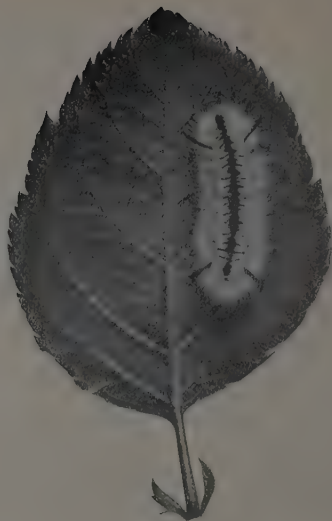
c. Apple leaf partly devoured by cankerworms.



d. Leopard moth larva in its burrow. Natural size.



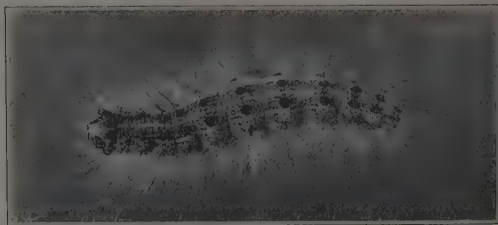
a. Nests of fall web-worm.  
(After Slingerland).



b. Hickory tussock moth. Fully  
grown caterpillar on leaf.  
Natural size.



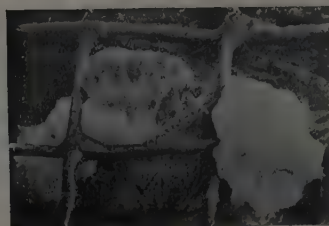
c. White-marked tussock moth  
caterpillar. Natural size.



d. Gipsy moth caterpillar. Natural  
size.



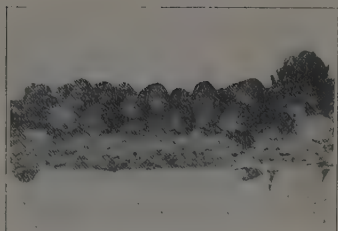
e. Gipsy moth egg-mass and pupa.



f. White-marked tussock moth. Nat-  
ural size. Female moth and  
egg-masses.



a. Oyster-shell scale on poplar.  
Natural size.



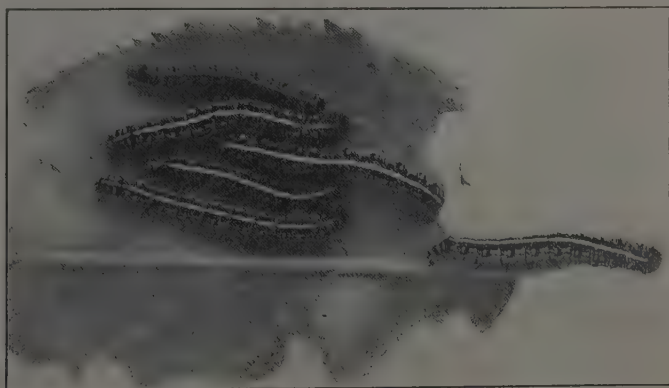
b. European fruit lecanium on  
blackberry. Natural size.



c. Nest of tent caterpillar.

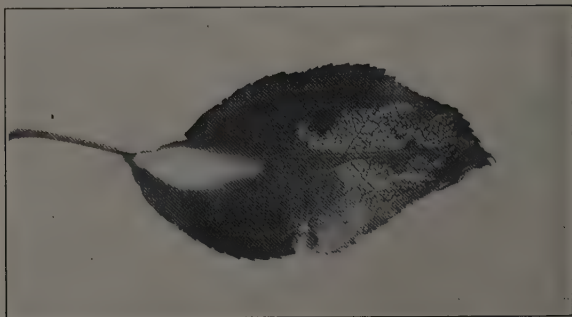


d. Egg-mass of tent caterpillar  
on twig. Natural size.



e. Tent caterpillars, partially grown. Natural size.

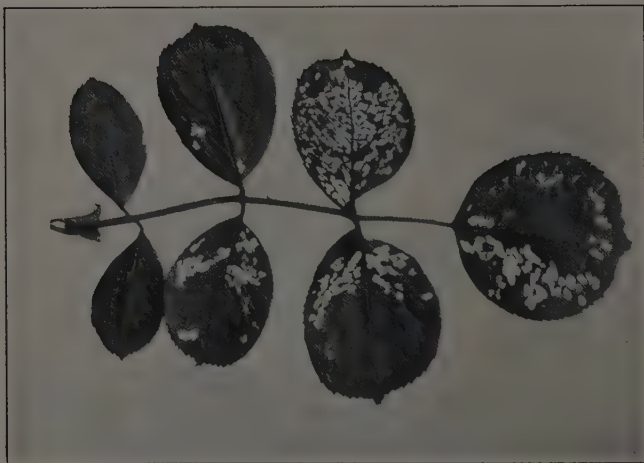
PLATE IV.



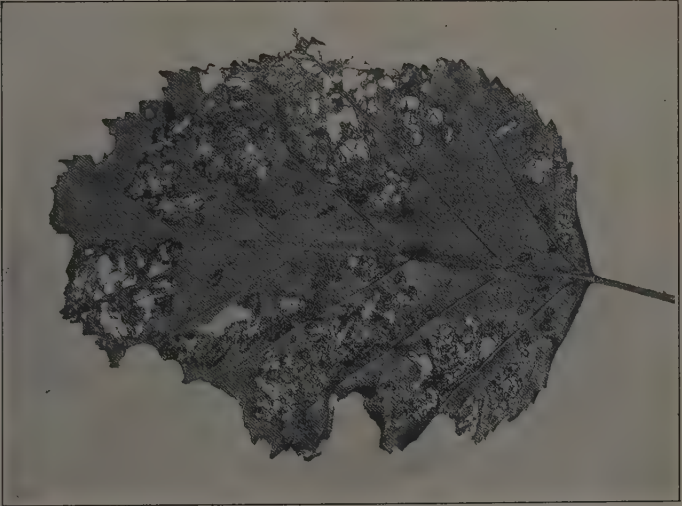
a. Apple and thorn skeletonizer; apple leaf eaten by caterpillar, and cocoon  
Somewhat reduced.



b. Japanese beetle; adults twice enlarged.



c. Rose leaves eaten by Japanese beetles. Natural size.



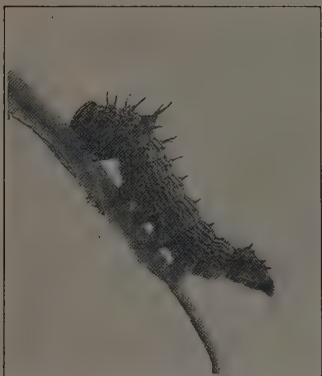
a. Birch leaf injured by the rose chafer. Natural size.



b. Peach twigs injured by larvae of the Oriental peach moth. Natural size.



PLATE VI.



a. Red-humped caterpillar. Enlarged one and one-half times.



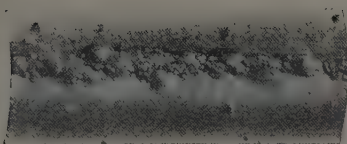
b. Yellow-necked caterpillars. Natural size.



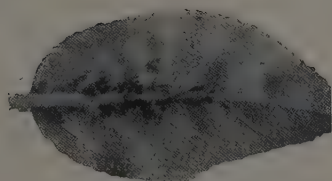
c. Budded fruit trees, showing where buds were destroyed by climbing cutworms. Natural size.



d. Peach borer in base of young tree.



a. San José scale on peach twig.  
Twice natural size.



b. Green aphids on apple leaf.  
Natural size.



c. Woolly aphids on twigs, showing  
galls and white flocculent ap-  
pearance.



d. Eggs of European red  
mite. Ten times enlarged.



e. Leaf showing work of  
pear leaf blister mite.  
Natural size.

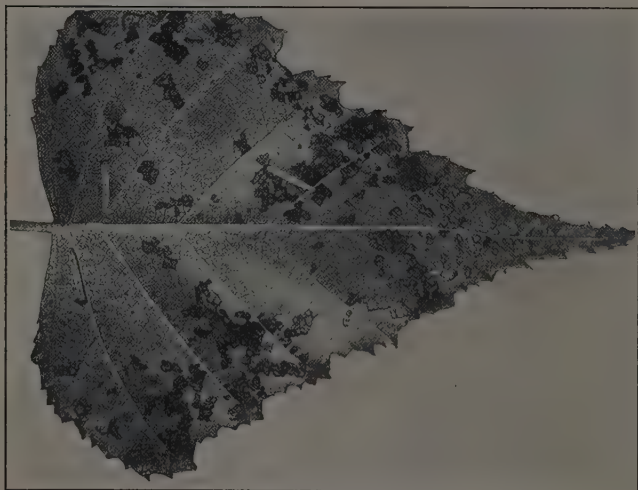


f. Scurfy scale on currant;  
males at left; females  
at right.

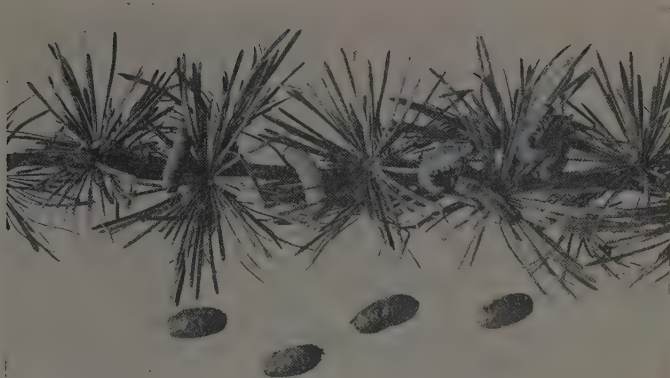
PLATE VIII.



a. Leaves of gray birch injured by the imported birch leaf miner.



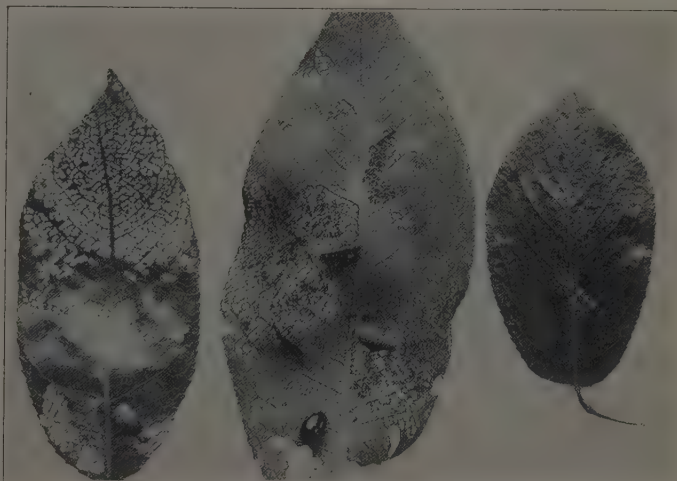
b. Larvae of birch skeletonizer on leaf of gray birch. Slightly enlarged.



a. Larvae and pupae of the larch sawfly. Natural size.

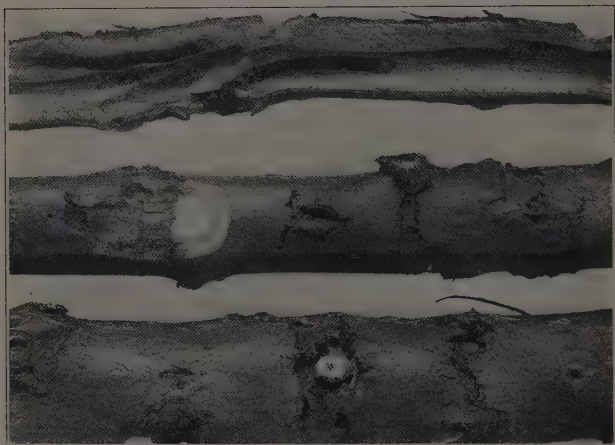


b. Elm leaf beetle larvae and their work. Natural size.



c. Larvae, pupa and adult of imported willow leaf beetle and injury to willow leaves. Slightly enlarged.

PLATE X.

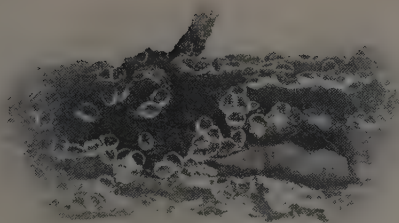


a. Work of poplar and willow borer. Natural size.



b. Linden borer, natural size, and its injury to young linden trees, greatly reduced.





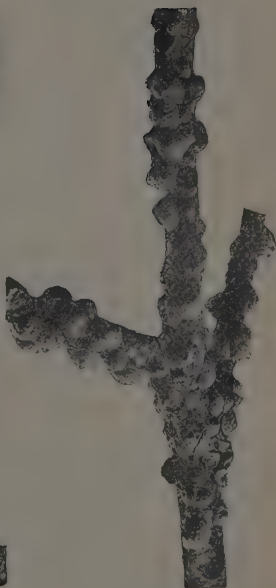
a. European elm scale. Natural size.



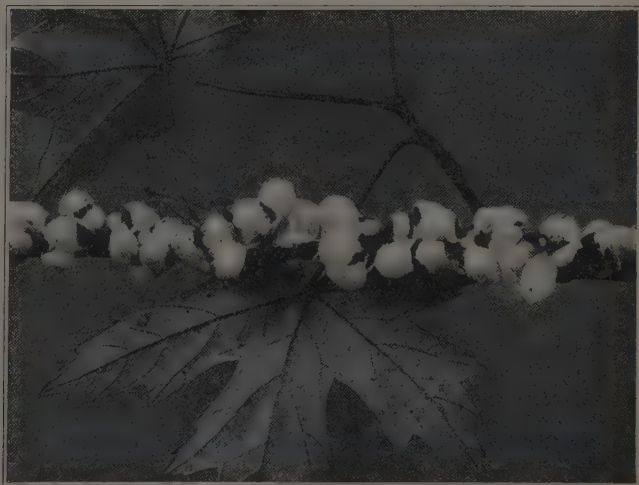
b. Terrapin scale. Natural size.



c. Pit-making oak scale. Natural size.



d. Tulip tree scale. Natural size.



e. Cottony maple scale. Natural size.



PLATE XII.



a. Saddle-back caterpillar.  
Twice enlarged.



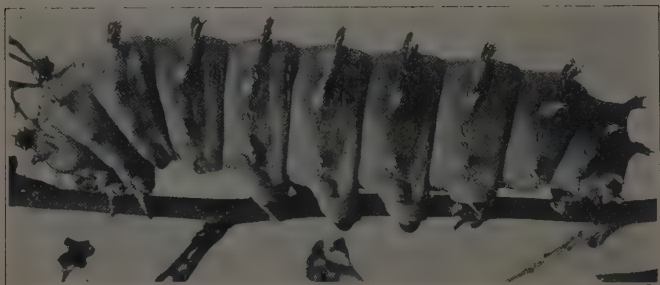
b. Eight-spotted forester. Adults and larvae,  
natural size.



c. Io caterpillars. Natural size.



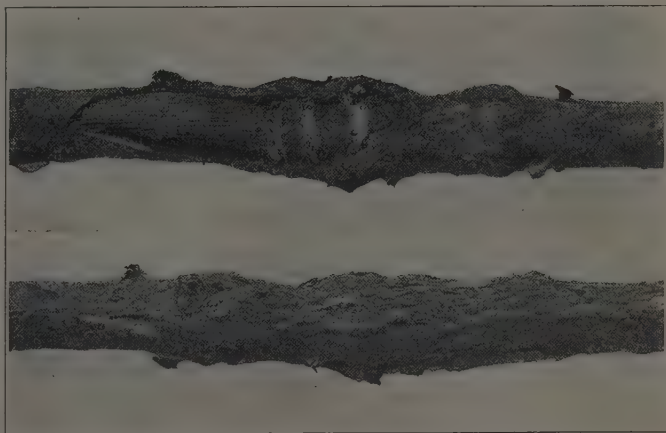
d. Pipe-vine caterpillar.  
Natural size.



e. Cecropia caterpillar. Natural size.



a. Lilac borer, showing adult pupa case and injured privet stem.  
Natural size.



b. Galls of rose stem girdler, twice enlarged.



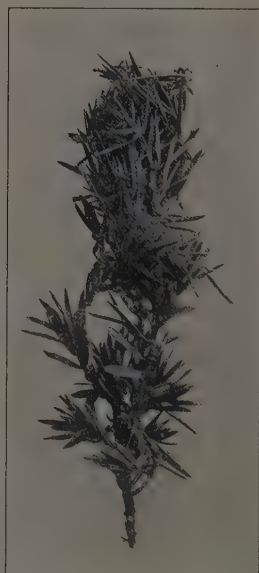
a. Rose scale, twice enlarged.



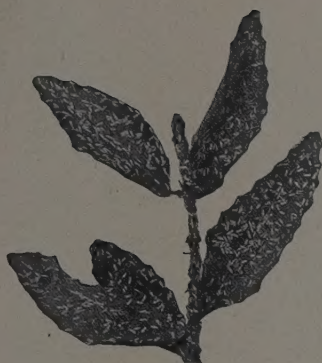
b. White peach scale, twice enlarged.



c. Imported pine sawfly larvae feeding on leaves. Natural size.



d. Work of juniper webworm.



a. *Euonymus* scale, mostly males. A few larger, gray females are present.



b. Grape-vine tomato gall.



c. Pine leaf scale, twice enlarged.



d. Mite galls on leaves of *Exochorda*.



e. Oak gall scale.



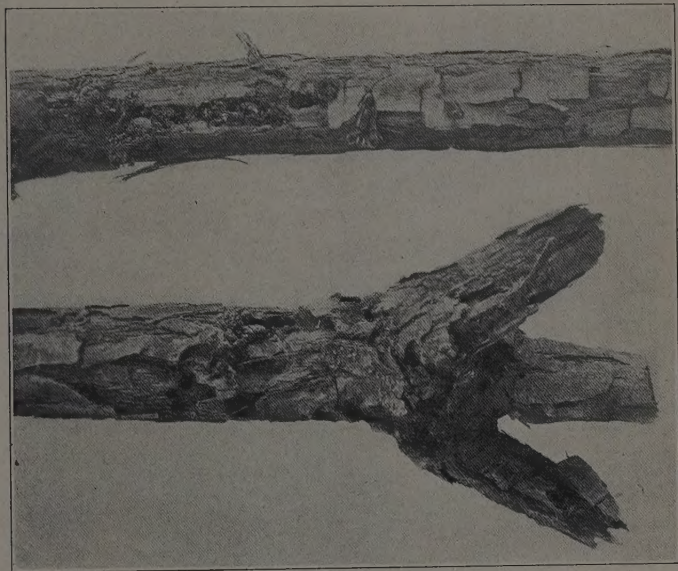
PLATE XVI



a. Boxwood leaf miner. White spots on leaves indicate infestation. Lower epidermis has been removed from two leaves, showing maggots. Natural size.



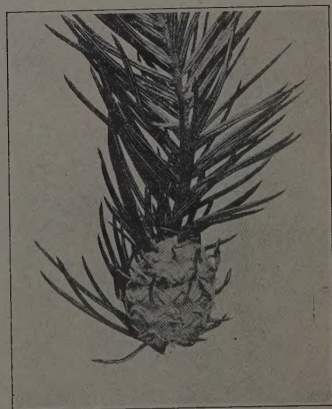
b. Work of arborvitae leaf miner, twice enlarged.



a. Rhododendron borer, Appearance of infested stems showing adult.  
Natural size.



b. Gall of blue spruce. Natural size.



c. Spruce gall. Natural size.

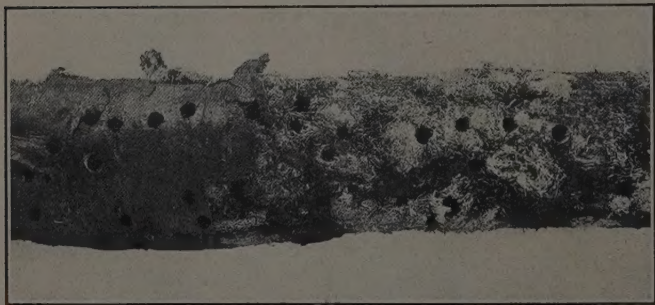




a. Pine bark aphid in small tufts on twigs and leaves. Natural size.



b. *Otiorhynchus sulcatus* Fabr. Larva, pupa, and adult.  
Twice enlarged.



c. Exit holes of white pine weevil. Natural size.